Financial Constraints and Product Market Decisions: the Role of Production Cycles

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Abstract

This paper studies how financial frictions affect product market decisions. As different products have different production cycles and generate cash-flow at different maturities, companies may adjust product mix in order to alleviate financial constraints. I use the wine sector in Portugal as a laboratory because product mix decisions can be identified and linked to cash-flow maturity. I exploit a banking regulatory shock which impacted negatively on credit availability, and I find that credit constrained firms change their product mix in response to the shock. Firms shift from long cash-flow maturity products to shorter ones. My results suggest that the adverse impact of financial constraints on product markets may be exacerbated with longer, less-flexible, production cycles.

JEL classification: D25, G30, G31, L15

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1 Introduction

Financial frictions affect real decisions of companies in several dimensions such as innovation (Howell, 2017, Krieger et al., 2018), investment in fixed capital (Campello et al., 2010, Cingano et al., 2016, Bucă & Vermeulen, 2017, Amiti & Weinstein, 2018) and employment (Chodorow-Reich, 2013, Berg, 2018). In this paper, I study whether financial frictions affect a central corporate decision – which products to produce. The response of firms to financial constraints in the product market is usually thought as aiming to increase revenues or reducing production costs (Matsa, 2011, Phillips & Sertsios, 2013). However, as different products have different production cycles and generate cash-flow at different points in time, companies may adjust product mix in order to shorten cash-flow maturity. This behaviour may not only have long-term implications for the firm, but also create inefficiencies in the economy as it may lead to different sets of products available to consumers.

Despite the importance of the question, providing an answer is an empirical challenge as it requires granular data on product mix as well as establishing the relation between each product and its contribution to the company's overall cash-flow maturity.[1] I overcome these challenges using a unique setting - the Portuguese wine industry. The wine sector is a suitable laboratory to test my research question as I can accurately observe product mix decisions and exploit the varying length of the production cycle to establish a link between products and company's cash-flow maturity. I denote it by the production cycle mechanism.

Investment decisions may be endogenous with respect to financial conditions as financial and investment decisions are simultaneously taken (Giroud et al., 2011) or may be influenced by a third variable (e.g. market competition). In order to address this concern, I exploit a source of exogenous variation in bank credit availability. In October 2011, the European Banking Authority (EBA) announced a Capital Exercise which required a subset of European banks to reach a 9% core tier 1 (CT1) capital ratio by June 2012.[2] This regulatory action is arguably a quasi-natural experiment. It was largely unanticipated by economic agents (Gropp et al., 2018) and it targeted banks in descending order of their market shares in each Member State such that it affected only the largest banks in each country. This creates a well-defined counterfactual. Lastly, the affected banks responded to higher capital requirements by cutting back on credit to the economy (Mésonnier & Monks, 2015, Blattner et al., 2018).

Using each companies' share of credit from affected banks as a measure of exposure to the adverse credit supply shock, I first show that companies with high exposure to affected banks faced a credit supply contraction following the regulation and this impact is stronger for companies

[1] Granular data on product market outcomes, such as product mix, is usually unavailable. To circumvent this obstacle, existing empirical work has focused on specific industries for which granular data is available (Argente et al., 2019).

[2] This represented a sizable increase relative to the previous 5% requirement established under Basel III. This regulation in the banking system aimed at creating "an exceptional and temporary capital buffer to address current market concerns over sovereign risk" (EBA, 2011).

that rely more on bank loans as a source of financing. I use a triple-difference specification as the main empirical approach, where treatment intensity is defined using companies' exposure to affected banks and pre-shock level of bank dependence (Amiti & Weinstein, 2018). In particular, I compare bank dependent companies with high exposure to affected banks (*treatment group*) with companies that are not exposed to affected banks or are not dependent on bank credit (*control group*).

I make use of the standardized classification scheme for agricultural products and foodstuffs in place in the European Union to identify companies' product mix. The Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) certifications are attributed to several agricultural products such as wine, cheese and fruit, with the goal of promoting and protecting the reputation of regional products. Regarding wine production, these classifications are associated with higher quality standards due to more rigorous production methods. These two product categories contrast with a third-category - non-classified wine, which is subject neither to specific regulation nor rigorous certification processes. Based on these classifications, consumers can form an expectation about each product's characteristics. Average prices among each category show that the market perceives them as different products in several European countries.[3] I also explore other product distinctions, namely colour (red and white wines).

I find that treated companies adjust product mix in response to the credit supply contraction. Specifically, companies reduce the percentage of top certification wine (PDO) on total production. The impact is economically and statistically significant. An increase in the share of credit from affected banks by one standard deviation decreases the percentage of top certification wine by 5 to 7 percentage points among bank dependent companies on average. I test whether companies also adjust in other margins, namely in total quantity produced and direct sale of grapes (after harvest). I do not find any statistically significant effect in those dimensions.

I investigate whether the reduction in the share of top certification wine may be driven by the need of shortening overall cash-flow maturity. In order to identify this channel, I exploit the variability in production cycle length associated with the wine ageing process. The ageing stage in the wine industry is very important and there is specific regional regulation imposing minimum ageing periods on the production of some certification categories. I exploit the cross-sectional incidence of these regional regulations as lower-bound constraints on cash-flow maturity via production cycle. In order to produce faster and generate earlier cash-flow, companies in those regions need to decrease the relative share of constrained products. If the length of the production cycle matters, I expected a stronger product mix rebalancing in regions where those constraints are in place.

I find that the previously documented reduction in the share of top certification wine is mainly

[3]This approach departs from other papers on wine value which use subjective measures such as experts' ratings or auctions' realized values (Gibbs et al., 2009, Dimson et al., 2015, Chen & Juvenal, 2016). Besides the subjectivity, those metrics only allow to study wines of famous winemakers, which poorly reflects the entire industry.

driven by companies operating in regions where a minimum ageing constraint is in place. An increase in the share of credit from affected banks by one standard deviation is associated with a reduction of 10 percentage points in the production of PDO wine in these regions. The contrasting results among the two types of regions suggest that the production cycle mechanism plays a role by constraining companies in their product market decisions.

Nevertheless, this interpretation relies on the assumption that these regions do not differ in other characteristics beyond the existence of an ageing regulation. In order to better identify the time restriction as the driving factor, I exploit the fact that these regulations apply usually to (top certified) red wines. By looking at the within-company decision of producing red and white wine, I show that companies adjust only the production of top certified red wine, i.e. the product which the existing regulation imposes a minimum ageing period on. This finding supports the role of the production cycle mechanism, i.e. companies rebalance product portfolios in favor of shorter production and quicker cash-flow conversion products.

A question that emerges from these findings is why companies rebalance current production mix in response to an adverse credit supply shock. Under limited ability to raise external financing, companies may generate internal funds in the short-term through an increase in sales of current inventory. I test for heterogeneous effects with respect to pre-shock inventory levels and find that the product mix rebalancing is stronger among companies with low inventory levels. Two interpretations can be drawn from this finding. First, selling the available inventory quantities might not be sufficient to overcome financial needs. Alternatively, by doing so companies might get closer to stock-out, which requires producing at a faster rate to replenish inventory levels. In any of the interpretations, the company may be compelled to rebalance product portfolio.

I investigate performance implications of the change in product mix in order to understand whether it can be an efficient strategy in the short-term. I analyze whether, among the set of affected companies, the ones that adjust product mix following the credit supply contraction perform better than those whose production remains unaltered. I find that companies that adjust the production of PDO wine downwards present higher short-term performance indicators following the shock. Overall, this result suggests that the temporary adjustment in product mix may be an optimal response to financial constraints in the short-term.

I perform several robustness tests. I use an accounting measure of inventory duration (Days Sales of Inventory) as a proxy for the duration of the production cycle. Consistent with the need for shorter production cycles, I find that the adjustment in product mix is stronger among companies with high pre-shock days sales of inventory ratio. I also investigate whether the rebalancing aims at reducing or avoiding certification costs. If certification costs were in fact driving my results I would expect companies to shift production from certified to non-certified categories. I find that the reduction in PDO wine is accompanied by a statistically significant increase in the production of PGI wine, whose certification costs are similar to the PDO wine. This result suggests that certification costs do not seem to explain my results. My findings are

also robust to alternative definitions of treatment and different time periods.

This study contributes to several strands of the literature. First, this paper contributes to the literature on companies' response to adverse financial shocks. Financial constraints can lead companies to change financial and investment policies (Campello et al., 2010). Berg (2018) shows that companies increase cash levels in response to financial shocks due to a precautionary savings motive. Lin & Paravisini (2012) show that companies adjust payout policy or equity issuance. Concerning investment decisions, it has been shown that financial constraints may affect innovation (Howell, 2017, Krieger et al., 2018), employment (Chodorow-Reich, 2013) or investment (Cingano et al., 2016, Bucă & Vermeulen, 2017, Amiti & Weinstein, 2018). In this paper, I show that product mix may also be a margin of adjustment in response to financial constraints.[4] Productive inefficiencies can emerge from this behaviour if investment opportunities do not go to the most efficient producers but rather to the producers who have the funds to pursue them.

It also contributes to the literature on the impact of financial constraints on product market outcomes. Relying on product availability as a measure of quality in the supermarket industry, Matsa (2011) shows that excessive financial leverage increases the probability of product shortfall. In the airline industry, Phillips & Sertsios (2013) document product quality (mishandled baggage and on-time performance) decreases when airlines are in financial distress. Kini et al. (2017) find that the probability and severity of product recalls increase with financial leverage. These studies suggest that companies may compromise current sales, customer loyalty or safety to achieve benefits associated with debt service. I contribute to this literature by showing that companies adjust product mix in order to achieve shorter cash-flow structures. To my knowledge, this study is the first to empirically investigate the role of this mechanism in product market decisions. It may explain why the impact of excessive leverage is more pronounced for vertically integrated supermarkets, i.e. the ones controlling longer sections of the supply chain resulting in longer cash-flow structures (Matsa, 2011).[5]

This application contributes to the literature on the real effects of credit rationing (Lemmon & Roberts, 2010, Chava & Purnanandam, 2011, Schnabl, 2012, Bonaccorsi di Patti & Sette, 2012, Chodorow-Reich, 2013, Iyer et al., 2013) by showing that a regulatory exercise in the banking system can have adverse implications to the real economy through product markets. Product markets are typically seen as being demand-driven, i.e. consumers define the type of products that they desire and quantities and prices are set according to demand and supply. My work suggests that financial market frictions such as credit rationing can impact on product

[4] Jovanovic & Gilbert (1993) discuss possible motives for product mix diversification: gaining market power, avoiding risk, having access to funds, making products compatible, reaping efficiency gains, and pursuing managerial goals.

[5] My results are also in line with Maksimovic & Titman (1991) who argue that managers favor short-term cash-flows to avoid financial distress, although their model relies on the assumption of debt overhang (Jensen & Meckling (1976), Myers (1977)), and with Chevalier & Scharfstein (1996), who document that companies may opt to generate earlier cash-flows because they are not able to invest.

availability.

The choice of focusing on a single industry comes at the expense of external validity. Nevertheless, the production cycle mechanism may be a key driver of product market decisions in several other settings. Straightforward cases include industries where different products require long production cycles (e.g. forestry activities, livestock production and certain types of foodstuff, such as wine or cheese).[6] This effect may also extend to other sectors non-dependent on inventories. Activities entailing large upfront costs and long development periods, such as innovative industries or the construction sector, are suitable examples. Under financial constraints, companies may decline positive NPV projects when the estimated development time is long. Finally, financial constraints may affect product market decisions through the production cycle mechanism in industries such as mining or oil extraction. Gilje et al. (2017) show that financial constrained companies anticipate completion of oil wells at the expense of long-run returns in order to alleviate financial constraints.

The remainder of the paper is organized as follows. Section 2 describes the setting. Section 3 describes the data, empirical methodology and presents descriptive statistics. Section 4 presents the results. In section 5, I show additional robustness tests. Section 6 concludes.

2 Setting

Research on product market decisions, such as product mix or quality decisions, requires granular information for which traditional financial disclosures offer poor guidance. Existing studies on product quality for instance focus on specific sectors where this information is available outside companies (Matsa, 2011, Phillips & Sertsios, 2013). This information is usually compiled by industry authorities or business watchers. In this paper, I use the wine industry as a laboratory to test my research question. Wine making is a very regulated activity in the majority of the European wine producing countries. Companies are required to disclose detailed information on production and inventory levels to competent authorities, which use this information to create exhaustive industry records that support policy and regulatory decisions.

Wine industry provides a suitable setting to explore the effect of financial constraints on product mix decisions. First and most importantly, product mix decisions can be accurately observed. Given the importance of this first requirement, I devote the following subsection to describe it in greater detail. Moreover, there is a close link between product choice and the length of the production cycle. On average, higher quality products are associated with longer ageing periods (Jackson, 2008, page 441). Although there may be some exceptions, a positive relation holds in the aggregate.[7] In some wine producing countries, there is even specific regulation imposing

[6] Regarding investment in woodland, in March 2017 Financial Times wrote *"There is a frightful interval between the seed and the timber."* So said the 18th-century wit and writer Samuel Johnson, but wait patiently for your forest to flourish and you could see a significant return on your investment.' https://www.ft.com/content/44153aae-0039-11e7-8d8e-a5e3738f9ae4

[7] To establish my argument, ageing does not necessarily need to be a driver of quality. Although this is

minimum ageing periods for several wine categories and usually for higher quality tiers.

The focus on this sector overcomes a few other limitations. First, harvest and production occur only once a year. Thus, it allows to identify the beginning of each production cycle and match it with the frequency of financial reporting.[8] Moreover, this is a market composed by non-listed, private, small and bank-dependent companies. Existing studies tend to look at large or publicly-traded corporations.[9] I depart from this approach by focusing mostly on small and medium enterprises. According to Eurostat, around 99,8% of non-financial active enterprises within EU-27 were SMEs in 2008, that jointly accounted for 59% of value added.[10].

2.1 Product Mix Measurement

I make use of the standardized classification scheme for agricultural products and foodstuffs introduced by European Union in 2012.[11] With the goal of promoting and protecting the reputation of regional products, the *Protected Designation of Origin* (PDO) and *Protected Geographical Indication* (PGI) denominations soon started appearing in the labels of several agricultural products such as wine, cheese, fruit, etc. Concerning wine production, certification systems and information disclosures regarding production characteristics have long been a practice in relevant wine-producing countries. Therefore, this new classification system was similar to the traditional *appellation* systems in place for decades in those countries, which legally defined and protected geographical indications (Jackson, 2008). Due to this fact, the classification resulting from national transpositions of the European regulation overlapped with the traditional classification in countries such as France, Italy and Portugal.[12]

In Portugal, wines certified with any of these mentions are perceived by the market as different products. Besides avoiding the misleading of consumers by non-genuine products, PDO and PGI denominations are associated with higher quality standards due to more rigorous production methods and certification processes. PDO is the highest quality category of wines followed by PGI.[13] The European Union certifies as PDO those products that are 'produced, processed and

certainly true for some wines, a positive correlation between the two suffices. That being said, one can think of alternative, unrelated to quality, explanations to why better wines may take longer to be placed on the market. Some examples include longer certification processes or different demand for wines in different tiers.

[8] Lovell (1961) mentions that "The task of investigating dynamic inventory phenomena is complicated by the difficulties involved in obtaining appropriate data based on observations collected at more frequent than yearly intervals. Since the planning horizon of the firm is surely shorter than a year (...), annual data will not do."

[9] Kashyap et al. (1994) examine micro data on US listed firms' inventory behavior but note that, if available, they would prefer to look at non-traded firms as these are most dependent on bank financing.

[10] Pocketbooks (2011).

[11] EU Regulation No 1151/2012 of the European Parliament and of the Council of 21 November 2012

[12] In France, for instance, the traditional Appellation D'Origine Controlée works in parallel with the new PDO nomenclature (Appellation D'Origine Protégée), but usually only the traditional one is presented in labels. The matching between these two classification schemes allows to apply the same classification standards for wines produced before 2012 in Portugal. Due to this fact, I will employ PDO and PGI nomenclature for all years in the sample.

[13] In some countries, there are some few examples of PGI wines whose reputation and price exceed those of

prepared in a given geographical area, using recognized know-how (...), whose characteristics are linked to their geographical origin. They must adhere to a precise set of specifications (...).' In the case of wine, the International Organization of Vine and Wine adds that this nomenclature is linked to a quality level attributed to the geographical milieu including natural or human factors.[14] The PGI denomination works similarly to PDO, although production rules are no so stringent as those applied to PDO. These two categories contrast with a third-category - non-classified wine.[15] Wines in this category are not subject to specific regulation or rigorous certification processes. Based on these three categories, consumers are able to establish a ranking of wine quality. Figure 1 exhibits average prices for each wine category in 2016 in some relevant European wine-producing countries. For example, in Portugal the average price per litre of PDO wine was roughly EUR 3, higher than PGI (EUR 2.43) and non-classified wine (EUR 1). Average prices for each of these categories in different European geographies do indeed confirm that the market perceives each product differently. I use this categorical distinction as a metric of product mix. In the European market, all the three categories have a significant expression. In 2016, total production was composed by 43% PDO, 21% PGI and 27% non-classified wines (ISMEA, 2017).[16]

A caveat of this approach it that it does not allow to distinguish wines within each classification. This feature marks a departure from recent literature on wine value, which uses wine-specific metrics such as experts' ratings or auction outcomes (Gibbs et al., 2009, Dimson et al., 2015, Chen & Juvenal, 2016). However, unlike my approach, these methodologies usually focus on wines produced by famous winemakers and do not cover the entire spectrum of companies.

2.2 Wine production in Portugal

Wine making has a long tradition in Portugal and wine has long been one of the Portuguese most exported products. According to the International Organization of Vine and Wine, Portugal ranked second in surface devoted to vines as a percentage of total country surface (2,1%) in 2016, only surpassed by Italy (2,3%). This importance extends to international trade, where Portuguese wines accounted for 2,7% of total wine exports in the world, ranking 9th in this list. A historical driver of this international success was an early regulation and monitoring of the sector. The first wine regulation dates back to 1756, with the establishment of the Douro Demarcated Region (where the famous Port wine is produced and exported from). This fact makes that region one of the oldest demarcated regions in the world. The idea of sector supervision persisted strongly until today and extends now to grape and wine production in all wine regions. A visible dimension of such supervision is the maintenance of *current accounts*.

PDO counterparts. I ignore those marginal cases as I am not able to identify them. If anything, this omission shall attenuate the findings.

[14] International Standard For The Labelling Of Wines, OIV.

[15] In some countries, this category is also called *Table Wine*. I opted not to use this term as it is not consistent across countries.

[16] The remaining 9% is must or varietal wine. The source distinguishes these two from the three main categories.

This is an exhaustive registration encompassing harvest, production and stock declared by wine makers to sector regulators on an annual basis. In order to accomplish an effective supervision, the Portuguese territory is divided into fourteen wine regions (figure A1). Each region has specific regulation on production processes, quality control and certification, and is supervised by an autonomous regional regulator. Besides ensuring companies comply with the regional-specific regulation, the regional regulators control and issue PDO and PGI denominations.

Figure A3 depicts the main stages of the wine production process. Wineries can produce grapes in their own estates as well as acquire grapes from other winegrowers. In Portugal, the latter is very common and allows producers to reach larger production volumes. The vines where grapes are harvested from may be classified as suitable for PDO or PGI (*appellation system*). Later on, producers will be able to request any of these certifications only for the quantity of wine made out of those grapes. This is a necessary, but far from sufficient, requirement for certification. Due to the *appellation system*, wineries commit to a provisional "maximum-quality" annual product mix in the beginning of each production cycle with the choice of the grapes used.[17] They are not bound to their vineyards though. In the case they own vineyards suitable for a given classification but prefer a different product mix, they might acquire grapes with a different or with no classification, selling their own if necessary. The next stage, shortly after harvest and grape acquisition, is grape processing into wine. By the end of this stage, companies are required to report production levels by type, suitability for any certification and color. The *current accounts* are updated with this new information.

Then, ageing can last for long periods depending on the type of wine. As soon as the wine is ready to be introduced in the market, wineries may request certification. The certification process encompasses three consecutive stages: administrative registration, physico-chemical and sensory analysis, and labeling. Administrative registration encompasses cross-validation of the quantity requested for certification and the one previously declared in the *current accounts*. In the second stage, winemakers deliver wine samples at accredited laboratories where chemical analyses take place. In parallel to this process, an accredited tasting panel carries out a sensory trial. Conditional on the results, the regulator then decide whether a wine fulfills the requirements to be certified as PDO or PGI. If a wine is approved with any of the denominations, the regulators are also responsible for verifying that the information in the label complies with European, national and regional guidelines and that comprehensive product information is made available to consumers. The approval of the label translates into each bottle receiving a numerically traceable seal of guarantee. This seal attests quality and origin of the product to the consumers. Figure A2 illustrates PDO and IGP seals of guarantee in Alentejo region. Wines that do not fulfill the requirements to be awarded one of the two quality denominations can still be traded as non-classified wine. Table A1 presents a more detailed description of each production stage.

[17] Declassification is possible but subject to regulators' approval.

Wine production is also divided into wine types. In Portugal there are three main types: still, liqueur and sparkling wine. PDO and PGI denominations can be attributed to more than one type in some regions, while in others only still wine can be granted one of these denominations. Table A2 summarizes the certified categories by region.

Another particular difference across regions is the existence of region-specific regulation imposing minimum ageing periods. Minimum ageing periods are mandatory by law and regional regulators often carry out on-site inspections to production facilities and wine cellars.[18] The required ageing periods differ across regions, type and color (red or white). In table A2, I present the mandatory minimum ageing period (in months) imposed by each regional-specific regulation. A company in Alentejo for instance can produce PDO, PGI or non-classified still wine with no mandatory ageing period. In contrast, a company in Algarve producing PGI or non-classified still wine is not subject to any ageing restriction but faces a 6-month minimum ageing requirement on PDO red wine production. For a large majority of regions where these regulations are in place, they only apply to PDO wines (the only exceptions are Douro and Azores). Color is also a distinctive feature in what concerns minimum ageing.[19] Looking at the columns that split still wine into red and white types, minimum ageing regulations apply only to red wines for a majority of the regions. In the case they apply to both red and white, red wines tend to have a longer minimum requirement than white wines.

The wine industry in Portugal is populated by micro, small and medium-size companies. A large majority exhibits sole-proprietorship or private limited ownership structures and relies on banks as the primary source of external capital. By focusing on this setting, I ultimately depart from the existing literature that focus on large or public companies.

3 Data and Empirical Methodology

3.1 Data Sources

I obtained access to the Portuguese *domestic wine file* from *Instituto da Vinha e do Vinho* (IVV). IVV is the national regulatory agency for the wine sector under the Portuguese Ministry of Agriculture. It coordinates the regional regulators responsible for the control and certification of wines and is responsible for maintaining and developing the *domestic wine file* (*current accounts*). This file is an exhaustive annual dataset comprising information spanning the wine production cycle: harvest, production and stock.[20] Winegrowers and winemakers are required to report production levels (Harvest-Production Declaration) and inventory levels (Inventory

[18] Imposing minimum ageing periods is not the only way to ensure an appropriate ageing period. In the *Port Wine* case, existing regulation imposes a sales limit on young wines (Viana & Rodrigues, 2006).

[19] Color (red, white or rosé) is a primordial division among still wines (Jackson, 2008, page 8). In Portugal, rosé wine does not have a significant expression when compared to the other two. Therefore, I treat rosé wine as white given the similarities regarding the production process.

[20] Only producers whose wine production does not exceed 4 000 litres and is destined for self-consumption are exempted from registration.

Declaration) in each season in accordance with Portuguese regulation.[21] The information collected in these two fillings is the primary input of the *domestic wine file*. This dataset is not publicly available and only sector aggregate statistics are published.

The data comprises all Harvest-Production and Inventory Declarations submitted by wineries between 2006 and 2016. In the Harvest-Production Declaration, companies report grape quantities by product type, color, region and destination (own production, delivery at a cooperative winery or sale to other winemaker) as well as the production volume of new wine by product type and color. Inventory Declaration is also a very detailed form, where companies report stock characteristics, namely quantities by location, product type, color, year of origin, and in-bulk/bottled status.

I supplement the main dataset with the Central Balance Sheet and Central Credit Registry provided by *Bank of Portugal* (central bank). The former is a comprehensive balance sheet dataset for Portuguese firms. The later details information on firm-level aggregated loan amounts and characteristics, such as total, effective, potential and overdue credit amounts; corresponding breakdown by maturity, collateral and guarantees required; and number of bank relationships. It aggregates all credit relationships between financial institutions and financial publicly limited or limited liability companies. This information is assembled by the central bank from commercial banks and other credit institutions on a monthly basis (Iyer et al., 2013, Blattner et al., 2018).[22]

I focus on companies for which financial data is available. I eliminate firm-year observations with negative total assets, total liabilities or cash. I also remove observations when cash or inventory are higher than total assets or when the company reports less than two employees. In order to alleviate concerns that companies may not invest in higher quality products because they lack the necessary knowledge or technology, I condition the analysis on companies that report a positive production of PDO wine at any point in time. Finally, I keep companies for which I have at least 3 years of data and operate in only one region. All variables are winsorized at the 1 and 99 percentiles.

Evidence from the 2008-financial crisis suggests a link between financial leverage and product mix decisions. Figure 2a shows a decline in the production of PDO wine in 2010 when the severe global crisis hit the Portuguese economy (Reis, 2013). Performing a separate analysis according to levels of leverage as of 2008, low- and high-leverage companies follow different trajectories (figure 2b). I observe that the former group reached the average pre-crisis benchmark two years later while a much persistent and lasting impact affected highly-levered companies. Although suggestive of the relation between financial constraints and product mix decisions, exploiting the financial crisis is not suitable to test this relation in a causal way as all agents in the economy

[21] Harvest-Production Declaration has to be submitted between the 1st of October and 15th of November, by the time harvest and grape transformation (into wine) must be completed. The Inventory Declarations are reported from the 1st of August to the 10th of September relative to inventory levels as of 31st of July.

[22] This dataset includes all loans above 50€. Such a low reporting threshold rules out the possibility of under-reporting for smaller companies.

were likely affected. Moreover, the crisis might have created distortions in dimensions such as (domestic or international) consumer preferences or market competition. Next, I present an alternative natural experiment to address my research question.

3.2 Natural Experiment: 2011 European Banking Authority Capital Exercise

The identification strategy exploits an unexpected shock to firms' credit availability - the European Banking Authority's 2011 Capital Exercise. Aiming to strengthen European banks' capital buffers against sovereign debt exposures, EBA announced a mandatory increase in capital requirements in October 2011. The measure established individual banks had to raise core tier 1 capital ratios (CT1) to 9 percent of their risk weighted assets (RWA).[23] It targeted the major banks in each European country.

This regulation was largely unanticipated by economic agents (Gropp et al., 2018, Blattner et al., 2018, Degryse et al., 2018). In that year, EBA had already conducted relevant stress tests and by that time, it had already disclosed information on the exposure of each European bank to sovereign risk.[24] Furthermore, there was no clear sign that a rise in capital requirements would induce a credit supply shortage. In fact, EBA strongly recommended banks to address capital shortfalls without reducing credit supply to the real economy. Given the unpredictability of this exercise and of its potential impact on the corporate sector, it is unlikely that individual companies anticipated a contraction in credit availability. Another distinctive feature of this quasi-natural experiment is the fact that EBA Capital Exercise targeted only the largest banks in each country, creating a well-defined control group. Finally, the Capital exercise deadline was set at June 2012. This exceptionally short time period (8 months) make more plausible that any observed impact is a consequence of the capital requirement shock.

Besides all efforts to ensure that the capital ratio was not 'achieved through excessive deleveraging, disrupting lending into the real economy', there is evidence that banks restricted credit supply. Using data at the European level, Mésonnier & Monks (2015) show that a bank that had to increase its capital ratio by 1 percent of RWA had on average an annualized loan growth 1.2 percentage points lower than unaffected banks. Similarly, Gropp et al. (2018) document that targeted banks increased capital ratios by 1.9 percentage points compared to the unaffected banks, and this increase was achieved mainly by reducing risk-weighted assets (denominator) than by increasing levels of capital (numerator). The decrease in RWA occurred mainly through a contraction of outstanding loans. They examine syndicated loan data in order to disentangle shifts in supply and demand for credit and find that affected banks reduced their credit supply

[23] This new level of core-tier-1-to-RWA ratio was not related to the risk exposure of any particular bank and represented a sizable increase relative to the previous level established under Basel III. More information about the EBA Capital Exercise can be found at: https://eba.europa.eu/risk-analysis-and-data/eu-capital-exercise

[24] None of the banks that failed the stress test were targeted by the Capital Exercise.

by 27 percentage points relative to the remaining banks. In Portugal, there is evidence of a similar effect, where banks responded to higher capital requirements by restricting lending (Blattner et al., 2018).[25]

I obtained information about credit relationships with affected banks at the time of the announcement from *Bank of Portugal*, specifically the number of relationships with affected banks and the share of credit granted from those banks.[26] In table A3, I present difference-in-differences estimates of the impact of EBA Capital Exercise on firms' total credit. In the first two columns, I present estimates on the full sample. An increase in the share of credit from affected banks by one standard deviation is associated with a 5% decrease in total companies' debt in the years after the shock. Next, I condition the analysis on the sample of bank dependent companies (columns 3 and 4). The intuition is that the effect of the shock is expected to be higher for bank-dependent companies, i.e. companies whose bank loans represent a larger share of total financing. I define as bank dependent all companies that have a high debt ratio (non-current liabilities scaled by total assets above the median in the end of 2011). As expected, the impact on total credit outstanding is stronger among this sub-sample. A standard deviation increase in the share of credit from affected banks reduces total credit outstanding by 11%. In the last two columns, I show the estimates of a triple-difference specification on the full sample. I find that the negative impact of the EBA Capital Exercise is driven by the cohort of companies that have a high share of credit from affected banks and are bank dependent.

Given the results above as well as the evidence from prior literature, I exploit the EBA Capital Exercise as a quasi-natural experiment. Importantly, I do not regard this shock as a pure reduction in leverage, which could theoretically lead to higher debt capacity in the future. Instead, the EBA Capital Exercise adversely impacted on credit availability in the short- and medium-term.[27]

3.3 Empirical Methodology

I estimate the following difference-in-differences specification:

$$\begin{aligned}\text{Product Mix}_{ijt} = \beta_1 \text{Post}_t + \beta_2 \text{Post}_t \times \text{EBA Share}_i + \beta_3 \text{Post}_t \times \text{Bank Dep.}_i \\ + \theta \text{Post}_t \times \text{EBA Share}_i \times \text{Bank Dep.}_i + \gamma X_{it} + \delta_i + \delta_t + \delta_{jt} + \epsilon_{ijt} \quad (1)\end{aligned}$$

where Product Mix_{ijt} is the share of PDO wine of company i, in wine region j, in year t on company's total production. Post_t is a binary variable equal to 1 after the EBA Capital

[25] In Portugal four banks have been affected by the EBA Capital Exercise. Those are: Caixa Geral de Depositos, SA; Banco Comercial Portugues, SA; Espirito Santo Financial Group, SA; and Banco BPI, SA.

[26] Due to confidentiality, the identity of creditors was not made available.

[27] This distinction is particularly important in a setting composed by small and medium size companies, where identifying financial constraints is difficult.

Exercise (2012 onward). The variable EBA Share$_i$ is the share of credit from affected banks at the time of the announcement (October 2011). Bank Dep.$_i$ is a binary variable taking on the value of 1 if the company had a high debt ratio in the end of 2011 (non-current liabilities scaled by total assets above the median in the end of 2011). In addition, the specification includes one-year lagged company's characteristics such as Size$_{t-1}$ (logarithm of total assets), Internal Market$_{t-1}$ (percentage of sales in the domestic market), and Any PDO$_{t-1}$ (a binary variable indicating whether the company has produced any PDO wine in the previous year). I include firm-cluster fixed effects δ_i which absorb all cluster-specific credit demand shocks (Gropp et al., 2018) and year-region fixed-effects δ_{jt}. The latter are intended to control for specific year-region characteristics, such as climate variation and shocks in credit supply or in consumer preferences. All standard errors are clustered at firm level.[28]

The coefficient of interest θ measures the impact of an exogenous increase in the likelihood of a credit contraction (as a result of exposure to EBA affected banks) on product mix. The triple difference specification is motivated by the findings in table A3. This approach allows to compare bank dependent companies with high exposure to affected banks (*treatment group*) with companies that are not exposed to affected banks or not dependent on bank credit (*control group*). Amiti & Weinstein (2018) take a similar approach and note that "a given bank shock is likely to have a much larger impact on the investment rate of a firm that finances, say, 80 percent of its capital through bank loans than on a firm that finances only 1 percent of its capital from loans". Alternatively, I also estimate the specification as a double-difference conditioned on bank dependent companies.

In order to evaluate whether the length of the production cycle plays a role in product mix decisions, I run the previous specification for groups of companies with *ex-ante* different production cycle duration. In the main analysis, I split companies according to regions where a mandatory minimum ageing regulation is in place (see section 2.2). This regulation imposes a minimum ageing threshold on PDO wines. If the length of the production process indeed constrains companies in their product mix decisions, I expect this group of companies to exhibit a different behavior following the credit supply shock. Yet, it is difficult to rule out other potential effects that might have occurred at the same time and might have impacted these groups differently (e.g. different credit supply shifts, changes in input or consumer prices, changes in consumer preferences). In order to alleviate this concern, I include year-region fixed effects in the specification. This attenuates the concern if those effects are likely to have taken place at region level. Furthermore, I go one step further and analyze within-company product mix decisions. As the minimum ageing regulations apply mainly to red wines, I analyze whether the adjustment is stronger for this type of wine. If the production cycle mechanism is at work, companies may be likely to adjust preferentially the production of red wine.

[28] Preferentially, I would like to cluster at creditor level as this is the main dimension of exposure to the shock. Unfortunately, I do not have information on each company's list of creditors.

3.4 Descriptive Statistics

In panel A of table 1, I present the number of observations. I obtained production data for 52 191 companies (278 371 firm year observations). Many of these producers operate as individual producers and are not formally registered as a company (financial data is not available). In effect, I have production data for 3 148 producers registered as companies (e.g. private limited), and 574 firms with available financial data (4 235 firm-year observations). Although I end up with a small fraction of all producers, they represent a sizable share of total wine production. The companies in the final sample represented around 67 percent of total production in 2008. I present a similar analysis for data on harvest and stock. By looking at a representative sample of domestic wine producers, I distinguish from other papers that focus on wines from famous wineries (Gibbs et al., 2009, Dimson et al., 2015). In panel B, I present descriptive statistics for companies in the final sample. The average size (total assets) is EUR 4.13 Million and have on average 19 employees. The typical firm in the final sample is mature (25.9 years). These companies hold high levels of inventory (24% of total assets), particularly in the form of finished inventories (21%). Inventories are not only high in volume but also kept for long periods. The days-sales-of-inventory ratio shows that on average these companies take 1 397 days to convert its inventory into sales. This distribution is skewed to the right though, with several companies with very long days in inventories. Although shorter, the median is still 552 days in inventories.

I present some descriptive statistics regarding the EBA Capital Exercise in panel C. At the time of the announcement (October 2011), companies in the sample had on average credit relationships with 3.2 banks and 75 percent of the companies had credit relationships with at least one of the affected banks.[29] The average share of credit from affected banks is 49%.

Next, I present some descriptive statistics on wine production (table 2). PDO wine corresponds to 60 percent of total production on average. The remaining categories (PGI and non-classified wine) have both significant expression as well. Still wine is the main type of wine produced (95%).[30] The average company produces 58 percent of red wine in each production cycle. Given the size of companies in the final sample, it is composed predominantly by producer-bottlers (96%), i.e. companies that control the production process from the wine-making phase until commercialization. Roughly half of the companies operate in regions with minimum ageing regulations (44%).

In panel A of table A4, I present a means comparison between the sub-sample of firms with at least 50% and the sub-sample of companies with less than 50% of credit from affected banks. The former sub-sample is composed by larger companies (according to total assets, number of employees and sales). Apart from size, these groups do not differ regarding other financial characteristics or wine production characteristics (the only exception is the production of red

[29] The high number of bank relationships with affected banks reflects the sizable market share of those banks. Recall that the EBA Capital Exercise targeted specifically the largest banks in each country.

[30] This figure may be slightly inflated due to missing observations for companies in Douro region. This is the region with the most significant production of liqueur wine (*Port wine*), both in terms of value and volume.

wine). Naturally, the sub-sample of companies with more than 50% of credit from affected banks differs from the other group in terms of bank relationship characteristics.

Panel B of table A4 exhibits a comparison of average characteristics of companies in regions with and without minimum ageing regulations. Companies in these regions do not differ in terms of financial characteristics. The only exception is the days sales of inventory ratio. Unsurprisingly, companies in regions where an ageing restriction is in place hold inventories over longer periods. This difference is statistically significant at 10% significance level. Companies in these regions differ in terms of wine production characteristics though. Specifically, companies in regions with minimum ageing restriction produce a lower percentage of PDO wine and more red wine. Importantly, they do not differ in the incidence of the shock. There is no statistically significant difference regarding the number of relationships with or the share of credit from affected banks. This fact arises from the country-wide presence of the targeted banks.

4 Results

This section presents the results. I start by showing evidence in favor of the parallel trend assumption in the context of the quasi-natural experiment induced by the EBA Capital Exercise. I then present estimates on the effect of the EBA Capital Exercise on product mix decisions. In order to assess the relevance of the production cycle mechanism, I perform the analysis on groups of companies with *ex-ante* different production timings. In particular, I exploit the regional variation in the existence of minimum ageing regulations. I further explore this mechanism by analyzing within-company decisions, namely the production of PDO red and white wine.

I test whether adjusting production (which will be converted into cash-flow some months or years later) is a natural response to a contemporaneous credit shock. Under financial constraints, companies can alleviate those constraints by selling current inventories immediately (e.g. inventory fire sales). I investigate if the effect is stronger for the set of companies with lower stock, i.e. those for which disposing of inventory may not be so effective (or insufficient) in relaxing financial constraints. By providing an answer to this question, I investigate potential complementarity between production decisions and current stock characteristics.

Finally, I investigate whether adjustments in product mix are an efficient response to credit constraints.

4.1 Credit Constraints and Product Mix Decisions

The quasi-natural experiment induced by the EBA Capital Exercise allows to explore the response of companies when faced with an exogenous contraction in credit supply. I have shown in table A4 that more exposed (treatment) and less exposed (control) companies do not differ in terms of financial characteristics, except in size. Due to this fact, I control for size in all specifications. However, the internal validity in a difference-in-differences setting requires

a (pre-shock) parallel trend. In figure 3, I present evidence in favor of the parallel trend assumption. I plot the coefficients and corresponding confidence intervals of interaction regressors between all year-dummies and a treatment binary variable.[31] I observe that the two groups of companies do not differ in terms of PDO production before the shock, but present a different behavior right after (2012 and 2013).[32] Such evidence, coupled with the very narrow adjustment period imposed by EBA, makes me confident about the internal validity of this quasi-natural experiment. Moreover, the fact that affected banks had country-wide operations creates room for within-region identification as I observe affected (treatment) and unaffected (control) companies operating in the same region. This alleviates the concern that other variables taking place at region level could drive a different reaction between the two groups. Some examples include changes in input prices, shifts in consumer preferences, or even differential impacts of the 2008 financial crisis across regions.

In table 3, I present estimates of the effect of credit constraints on product mix decisions. The main outcome is the share of PDO wine on company's total annual production. The econometric specification follows equation 1. I find a sizable and statistically significant reduction in PDO wine production in response to the credit contraction induced by the EBA Capital Exercise. An increase in EBA Share of credit by one standard deviation reduces the percentage of PDO in total product mix by 5 to 7 percentage points among the group of bank dependent firms. This is the group that has been significantly affected by the shock as seen in table A3. The result is robust to the inclusion of firm fixed and year-region fixed effects and is statistically significant at least at 5% significance level in all specifications. I also observe that there is a high persistence of PDO production across time. The variable Any PDO, which equals one whenever a company has produced PDO wine in the previous year, is a strong determinant of PDO production in the following year. Yet, the effect of the shock is robust to the inclusion of this variable. In table A5 in the appendix, I present similar results using a double difference specification. This analysis is conditioned on the set of bank dependent companies. The findings are similar, although the statistical significance is affected by the reduction in the number of observations.

A potential concern with the interpretation of the previous results arises from the fact that the 'Bank Dependent' variable may be capturing other financial characteristics. To address this issue, I extend the main specification with other financial characteristics of interest. Specifically, I look at size, debt maturity and trade credit. Results are shown in table 4. The adverse effect of the shock is stronger for large companies and companies with a higher percentage of short term credit. Conversely, reliance on trade credit (measured by accounts payable) as an alternative source of financing attenuates the adverse impact of the credit contraction. Importantly, the main coefficient remains unaltered after the inclusion of these variables. This is evidence that

[31] The treatment variable assumes the value of one if a company's share of credit from affected banks is higher than 50% and is bank dependent.

[32] In figure A4 in the appendix, I plot the median and mean PDO wine production over time. It also shows a similar evolution between treatment and control groups before the shock.

the 'Bank Dependent' variable is unlikely to be capturing other potential confounding financial characteristics.

In the face of credit constraints, there are other margins in which companies in my sample could adjust, such as total quantity produced or the percentage of grapes sold right after harvest.[33] In table 5, I investigate whether companies have adjusted in any of these margins in response to the shock. Looking at the log of quantities, I do not observe any statistically significant difference between affected and unaffected companies.[34] Similarly, I do not find a differential response regarding the percentage of grapes kept for own production.

Overall, the results in this sub-section document an adverse impact of financial constraints on product market decisions of companies. This evidence is consistent with the empirical findings in Matsa (2011), Phillips & Sertsios (2013) and Kini et al. (2017).

4.2 Production Cycle Mechanism

There are several mechanisms one may think of through which financial constraints may affect product market decisions. In this paper I study the production cycle mechanism. In the face of financial constraints, companies may be compelled to adjust product mix as a means of shortening the production cycle. In order to isolate this mechanism, I exploit the existence of minimum ageing thresholds for some products. In particular, these restrictions apply mainly to PDO wine production. Exploiting this regional variation enables identifying the role of this mechanism on product market decisions.

In the first three columns of table 6, I estimate the main specification among the group of companies operating in regions where there is a minimum ageing restriction. I find a significant and strong reduction in the percentage of PDO wine. An increase in EBA Share by one standard deviation is associated with a reduction of 10 percentage points in the production of PDO wine among bank dependent companies. In the following three columns, I analyze the impact of the shock in regions where there is no minimum ageing restrictions on the production of PDO wines. The point estimates are much smaller (and non-significant in two out the three specifications). In table A6, I show similar results following a double-different approach. The contrasting results among the two types of regions suggests that the ageing restriction (proxy for the length of production cycle) plays a role and constrains companies in their product market decisions.

The previous findings rely on the assumption that these regions do not differ in other dimensions beyond the existence of an ageing regulation. However, other variables such as production costs might have evolved differently after the shock among the two types of regions (e.g. cost of grapes acquired from winegrowers or certification costs). I attempt to mitigate this concern

[33] Another interesting margin is the adjustment in sale prices. Unfortunately, I do not have information on prices by company.

[34] Looking at total quantity is also important because the main outcome variable is the percentage of PDO wine in total production. As I do not find any impact on quantity (denominator), the reported decrease in the percentage of PDO wine arises is due to a lower production of PDO wine (in levels).

in several ways. First, the inclusion of year-region fixed effects shall attenuate this concern as it compares companies operating in the same region. Second, I can analyze within-company product decisions. Specifically, I propose to study the decision of producing PDO red or PDO white wines. In a large majority of regions where minimum ageing regulations are in place, they only apply to PDO red wines. If the crucial difference between these two types of regions is the existence of the ageing regulation, I expect to observe a stronger impact on the specific type of wine to which the regulation applies.

In table 7, I analyze the decision of producing PDO red and white wine among companies producing in regions where a minimum ageing restriction is in place. In the first three columns, the outcome variable is the percentage of PDO red wine. In the remaining columns, the outcome variable is the percentage of PDO white wine. I find that the effect reported in table 6 is entirely driven by an adjustment in the percentage of PDO red wine. There is no statistically significant shift on white wine production. Similar results are found using a double-difference specification (see table A7). By looking at this within-company margin of adjustment, I rule out other factors that could have potentially affected regions or even companies in a singular way. Therefore, this finding illustrates in a more clear-cut way the role of the production cycle mechanism.

In table A8, I present a similar analysis for regions where there is no minimum ageing restriction. In accordance with the findings in table 6, there is no statistically different response in the production of PDO red or white wine among this group of companies.

Overall, affected companies adjust product mix in response to financial constraints. The previous evidence suggests that this adjustment occurs as a means of shortening production cycles.

4.3 Production Decisions and Characteristics of Current Stock

The previous results show that the credit supply shock induced by the EBA Capital Exercise had implications on product market decisions. Affected companies seem to respond to the shock by adjusting their product mix. Alternatively, a more direct way to alleviate financial constraints and generate cash-flow in the short- and medium-term would be an increase in sales (selling current inventory). This way, companies would eventually avoid unnecessary adjustments in production. Therefore, it is important to understand how adjusting current production (which only converts into cash-flow some months or years later) can help ease financial constraints as opposed to selling inventory. In this section, I analyze whether there is a relation between adjustment in production and levels of inventory.

In table 8, I observe how the adjustment in product mix relates to levels of current stock. I split companies according to low (below median) and high (above median) inventories over total assets, either measured as balance sheet inventories (columns 1 and 2) or total wine in stock (columns 3 and 4).[35] The effect of the shock is very strong and statistically significant among

[35] Although positively correlated, the later measure differs from the former as it does not take into account the value of the inventories.

the group of companies with low levels of inventory. Although the point estimates are negative among the other group as well, the effect is not statistically significant. These results show that the adjustment in production occurred precisely in companies with low levels of inventories i.e. the group of companies for which disposing of inventory may not be so effective in alleviating financial constraints. These results point to a complementarity between production and levels of current stock. As managers see lower inventory levels and eventually get closer to stock-out, they seem to start adjusting production in order to produce faster and replace inventories at a faster rate. In my setting, it translates into a change in product mix.

4.4 Performance

In the previous sections, I document that companies adjust product mix in response to credit constraints. In this section, I investigate whether this is an optimal response from the perspective of a company. I start by showing the direct impact of the EBA Capital Exercise. The EBA Capital Exercise induced an exogenous credit contraction. Thus, if anything, I expect to see a negative effect on performance outcomes of companies affected by this additional constraint relative to unconstrained companies. Then, it is also important to understand whether, among the set of affected companies, those that have adjusted their product mix indeed performed better than the ones whose production remained unaltered. If anything, I expect companies that decreased the percentage of PDO wine to have improved performance relative to the other group (negative relation).

In panel A of table 9, I present the direct effect of the EBA Capital Exercise on performance. The outcome variables are operating profit margin and return on assets. According to the prediction, companies affected by the EBA Capital Exercise present lower performance relative to unaffected companies. The coefficients are not statistically significantly different from zero though. Next, I present the effect on performance mediated by the adjustment in product mix. Specifically, I analyze the effect that the adjustment in PDO wine production has on performance outcomes among the group of affected companies. It is important to recognize that this exercise is not clearly identified as deciding on how much PDO wine to produce is an endogenous decision. Even though, it may give some indication about the direction of the effect. In panel B of table 9, I show the results on this mediated effect. I interact the Post indicator with the percentage of PDO wine. Across the different specifications and outcome variables, I find a negative coefficient and significantly different from zero at least at 10% confidence level. Among the companies that were effected by the shock, those that adjusted the production of PDO wine downwards present higher performance ratios. This interpretation is consistent with the initial prediction and suggests that adjustment in production was an optimal response to the shock in the short-term.

5 Robustness tests

In this section I present several robustness tests. A substantial part of the previous analysis relies on the existence of minimum ageing regulations as a proxy for production cycle length. In order to tackle the concern that these regions could differ in other potential dimensions, I looked at the within-company decision of producing red and white wines and show that companies adjust the production of the most restricted product (PDO red wine). As a robustness test, I proxy the duration of the production cycle a commonly accepted measure of inventory timing in the literature: Days Sales of Inventory ratio. If time is indeed a constraining factor, this variable should point towards a similar effect.[36] In table 10, I run the main specification among the group of companies with high and low Days Sales of inventory. The results are consistent with previous evidence. The adjustment occurs for companies with long inventories, i.e. those for which it takes longer to convert inventory into cash-flow.

A second question is whether companies reduce PDO production due to higher certification costs. In table 11, I show that the reduction in PDO wine is accompanied by an increase in the production of PGI wine. If certification costs were a driving mechanism of the effect reported in the previous sections, I should expect companies to reduce PDO in favor of non-classified wine (the type that does not undergo certification processes). Therefore, I find evidence against this alternative mechanism.

I now perform several additional tests. In figure A5, I plot the histogram of average PDO wine production (in percentage) per company. There is clustering around 0 and 1. As a robustness test, I estimate the main model following a Tobit specification with left- and right-censoring (table 12). Results are similar to the ones found in table 3. Additionally, I present estimates of a Probit model where the outcome variable equals one when the company produces 100% PDO wine. The likelihood of a treatment company producing 100% PDO wine reduced by 31 percentage points on average following the shock.

In table 13, I present results using alternative definitions of treatment. Specifically, I consider as treated all companies with at least one bank relationship with affected banks (panel A), companies with at least 50% share of credit from affected banks (panel B) and a continuous variable of share of credit from affected banks weighted by each banks' distance to EBA Capital Exercise target capital ratio (Panel C). All alternative specifications document an overall negative impact of the shock on production of PDO wine and a stronger impact among regions with minimum ageing restrictions (column 2). Finally, I consider different time periods or samples. In panel A of table 14, I include 2014 in the analysis. In panel B, I exclude 2011 from the analysis. In panel C, I include companies that always produced PDO wine (these companies were initially

[36] This variable needs to be interpreted carefully due to the possibility of measurement error. Many wineries have a vertically integrated productive process and part of the grapes used in wine production may come from own grape production. Given that this measure uses COGS, it is ultimately dependent on how companies report internal production. See Viana & Rodrigues (2006) for a survey of other accounting problems in the wine industry.

removed from the sample). The results are robust to any of these alternative specifications.

6 Conclusion

Financial frictions have been shown to affect real decisions of companies in several dimensions. In this paper, I study whether the need for shorter cash-flow maturity and quicker cash-flow conversion affects product mix decisions. As different products have different production cycles and generate cash-flow in different points in time, companies may adjust product mix in order to alleviate financial constraints - production cycle mechanism.

Using the wine sector in Portugal as setting, I find that companies adjust product mix in response to a credit supply contraction by the banks targeted by the 2011 European Banking Authority Capital Exercise. An increase in the share of credit from those banks by one standard deviation decreases the percentage of top certification wine in total product mix by 5 to 7 percentage points among bank dependent companies, on average. The impact of the adverse credit supply shock on product mix decisions is more pronounced for larger companies and companies with more debt maturing in the short-term, and less severe for companies that rely more on trade credit.

I investigate whether the production cycle mechanism may drive the observed behaviour. To identify this mechanism, I exploit the cross-sectional regional incidence of minimum ageing regulations which impose a lower bound on the production cycle length of top certified wines. In regions where such regulations are in place, companies need to rebalance production in favour of the unconstrained products (lower categories) in order to produce faster. I show that the impact found in the full sample is mainly driven by companies in these regions, which suggests that companies adjust product mix as a means of achieving shorter cash-flow maturities.

I find that affected companies that adjust product mix in response to the shock exhibit higher performance indicators than companies whose production remains unaltered. This result suggests that the adjustment in product mix may be an efficient response to financial constraints in the short-term on the companies' perspective.

Product markets are typically seen as being demand-driven, i.e. consumers define the type of products they desire, and quantity and price are set according to demand and supply. My findings suggest that financial constraints play a role in product mix decisions, which in a general equilibrium framework, may narrow the set of products availability to consumers. Financial frictions may also lead to inefficiency in production if investment opportunities do not go to the most efficient producers but rather to the producers who have the funds to pursue them. Finally, my results suggest that the adverse impact of financial constraints on product markets may increase with longer, less flexible, production cycles.

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7 Figures

Figure 1: Average wine price (EUR/litre) in 2016, by product category

This figure displays the average wine prices (EUR/litre) by product category for major European wine producing countries. The product categories are: Protected Denomination of Origin (PDO), Protected Geographical Indication (PGI), and Non-Classified Wine. Export prices, domestic consumer prices and price on large distributors are presented for regions marked with (a), (b) and (c), respectively. All figures are reported as of 2016. *Sources*: Eurostat (EU-28), Instituto da Vinha e do Vinho (Portugal), Statista.com (France and Italy) and Observatorio Español del Mercado del Vino (Spain).

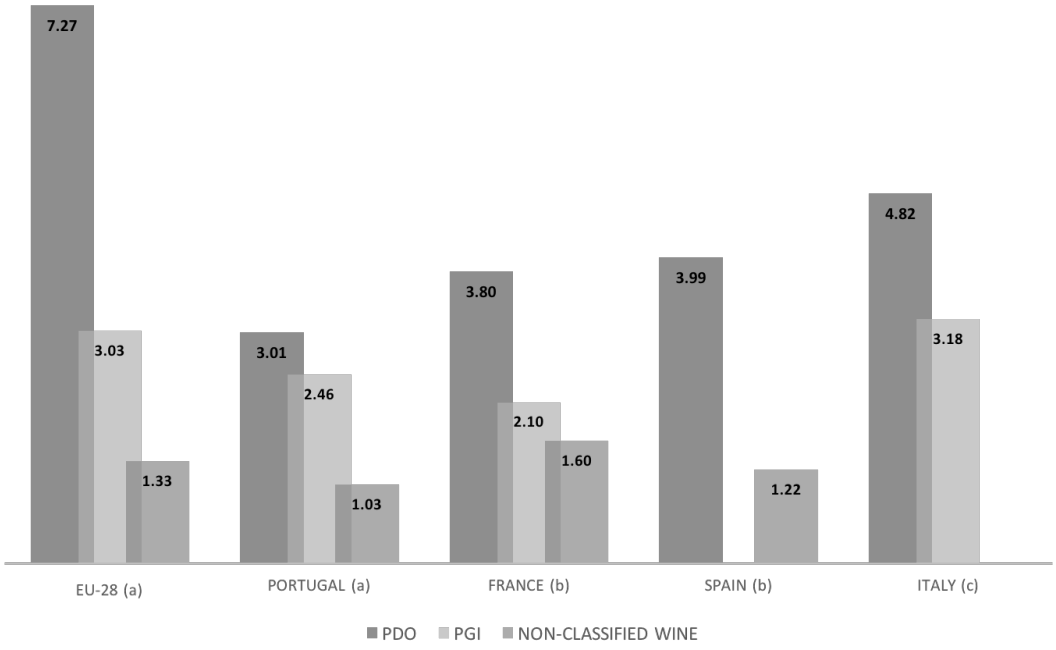
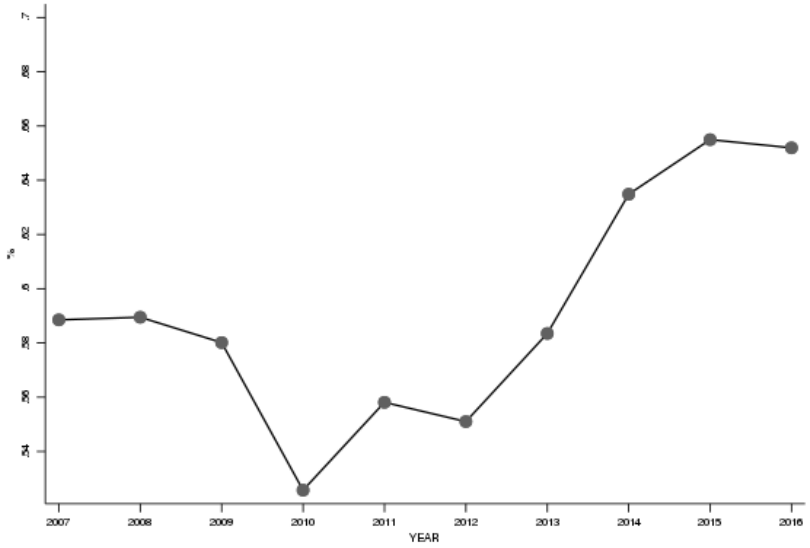
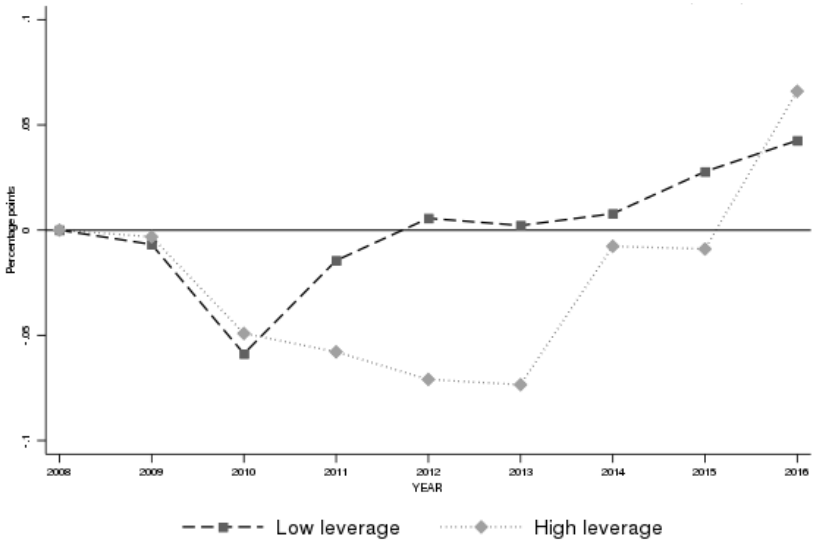


Figure 2: Evolution of PDO certified wine production

This figure exhibits the evolution of PDO certified wine production. Subfigure 2a depicts the evolution of PDO certified wine production in percentage of total production. Subfigure 2b shows the evolution relative to pre-crisis levels (2008) for high- and low-leverage companies. A company is defined as high (low) leverage if total assets over total liabilities are higher (lower) than the median.



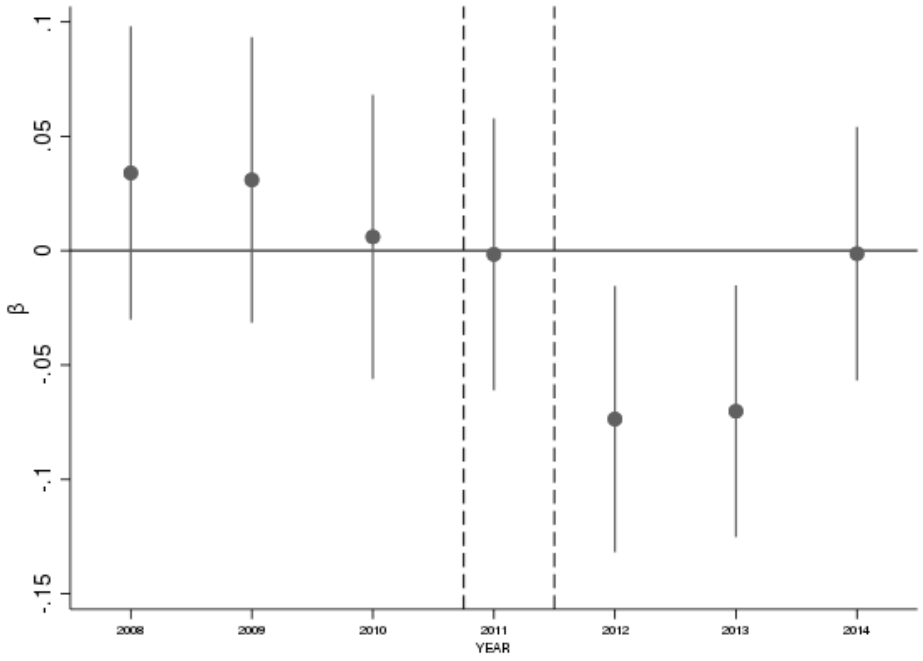
(a) In percentage of total production



(b) Relative to pre-crisis levels (2008)

Figure 3: Parallel trend

This figure plots the coefficients and confidence intervals (95% significance level) of the effect of the EBA Capital Exercise on PDO certified wine production. The dependent variable is the percentage of PDO wine in total wine produced. The explanatory variables are annual dummy variables that take the value of one in year t if a given company has been affected by the EBA Capital Exercise. I define as affected a company that had at least 50% of total credit from affected banks and is bank dependent. The regression controls for logarithm of size and includes year fixed effects and robust standard errors. Vertical lines delimit the period between EBA Capital Exercise announcement and deadline.



8 Tables

Table 1: Number of observations and firm descriptive statistics

Panel A of this table displays the number of company-year observations for different samples. "Formally Registered" refers to the sub-sample of entities (vintners, winemakers or bottlers) formally registered as a company. The last column exhibits the share in volume (harvest, production or in-stock wine) of companies in final sample relative to the aggregate total volume. These values are computed as of 2008. Panel B presents financial characteristics of companies in final sample. Panel C presents summary statistics of bank relationships at the time of EBA Capital Exercise announcement in October 2011 (one observation per company). The sample period is 2006-2016.

Panel A: Number of observations

	All Data	Formally Registered	Final sample	% Total volume (2008)
Harvest	374 990	21 137	3 094	18%
Production	278 371	15 315	4 235	67%
Stock	32 958	11 589	3 870	58%

Panel B: Firm Characteristics

	Obs.	Mean	St. Dev.	25%	50%	75%
Total Assets	5 031	4 129 119	5 204 988	581 512	1 864 778	5 282 216
Cash	5 010	118 850	220 780	8 092	28 585	105 749
Total liabilities	5 031	2 404 748	3 145 739	319 093	1 002 835	3 135 860
Sales	5 017	1 612 749	2 699 776	124 738	406 843	1 574 502
Net income	5 031	10 013	168 278	-34 519	3 908	34 480
ROA	4 556	-0.01	0.16	-0.03	0.00	0.02
Leverage	5 031	0.69	0.60	0.47	0.64	0.84
Inventory	5 031	819 329	974 276	77 882	343 483	1 268 877
Inv./Assets	5 031	0.24	0.18	0.10	0.20	0.35
Days in inv.	4 911	1396.9	2232.7	223.9	552.7	1422.1
Nr. Employees	5 031	18.7	41.4	4.0	8.0	19.0
Firm age	5 028	25.9	23.9	9.0	18.0	38.0
Pct. Domestic Market	5 017	0.88	0.21	0.85	0.99	1.00
Bank Rel.	4 787	2.8	2.6	1.0	2.0	4.0
Largest bank rel.	4 350	0.77	0.24	0.57	0.84	1.00
Pct. short-term	2 932	0.49	0.38	0.10	0.47	0.99
Personal Guarantee	2 966	0.47	0.41	0.00	0.40	0.96

Panel C: EBA Capital Exercise (Oct 2011)

	Obs.	Mean	St. Dev.	25%	50%	75%
No. bank relationships:						
All	439	3.2	2.6	1.0	2.0	4.0
With affected banks	439	1.2	1.0	1.0	1.0	2.0
With affected banks:						
At least 1 relation	439	0.75	0.43	1.00	1.00	1.00
Share of credit	439	0.49	0.41	0.00	0.51	0.94

Table 2: Wine production descriptive statistics

This table reports summary statistics related to wine production. In the last two rows, statistics are computed taking one observation per company. All statistics are presented for the final sample.

	Obs.	**Mean**	**St. Dev.**	**25%**	**50%**	**75%**
Harvest for own production	3 094	0.82	0.33	0.78	1.00	1.00
Production by denomination:						
PDO	4 235	0.60	0.40	0.15	0.75	1.00
N. Class.	4 235	0.14	0.28	0.00	0.00	0.10
Production by type:						
Still	4 235	0.95	0.16	1.00	1.00	1.00
Liqueur	4 235	0.03	0.13	0.00	0.00	0.00
Red wine	4 235	0.58	0.33	0.27	0.68	0.85
Bottled wine	3 870	0.22	0.24	0.05	0.13	0.31
Region Min. Ageing Restriction	545	0.44	0.50	0.00	0.00	1.00
Producer-bottler	554	0.96	0.20	1.00	1.00	1.00

Table 3: Effect of Credit Constraints on Product Mix Decisions

This table presents the impact of the EBA Capital Exercise on product mix decision. The outcome variable is the percentage of PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size_{t-1} is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share × Bank Dep.	-0.136**	-0.144***	-0.166***	-0.133**	-0.132**	-0.151***
	[0.066]	[0.054]	[0.055]	[0.060]	[0.052]	[0.052]
Post × EBA Share	0.035	0.046	0.062**	0.048	0.044	0.052*
	[0.037]	[0.028]	[0.031]	[0.033]	[0.027]	[0.030]
EBA Share × Bank Dep.	-0.028			0.086		
	[0.101]			[0.085]		
Post × Bank Dep.	0.028	0.052	0.064*	0.063	0.058	0.064*
	[0.043]	[0.038]	[0.039]	[0.041]	[0.038]	[0.038]
Post	0.012	-0.013	0.026	-0.012	-0.016	0.039
	[0.026]	[0.019]	[0.031]	[0.022]	[0.019]	[0.070]
EBA Share	0.020			-0.018		
	[0.068]			[0.058]		
Bank Dep.	0.057			-0.019		
	[0.061]			[0.053]		
Size $_{t-1}$				-0.039***	-0.018	-0.008
				[0.011]	[0.023]	[0.023]
Internal Market $_{t-1}$				-0.022	0.038	0.033
				[0.079]	[0.044]	[0.046]
Any PDO $_{t-1}$				0.531***	0.103***	0.106***
				[0.025]	[0.032]	[0.036]
Firm FE	No	Yes	Yes	No	Yes	Yes
Year X Region	No	No	Yes	No	No	Yes
No. Observations	2471	2471	2320	1991	1991	1855
No. Firms		422	413		392	381
Adjusted R^2	0.002	0.77	0.773	0.225	0.795	0.797

Table 4: Is Bank Dependent Definition capturing other financial characteristics?

This table analyzes whether the Bank Dependent variable is capturing other relevant firms' characteristics. I extend the specification in table 3 with some interaction variables of interest, namely size (Large Company), debt maturity (High Short-Term Credit) and payment terms with suppliers (High Account Payable).The outcome variable is the percentage of PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size_{t-1} is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Large company	*High Short-Term Credit*	*High Acc. Payable*
	(1)	(2)	(3)
Post × EBA Share × Bank Dep.	-0.188***	-0.157***	-0.153***
	[0.055]	[0.056]	[0.053]
Post × EBA Share	0.235***	0.118***	0.006
	[0.080]	[0.042]	[0.036]
Post × Bank Dep.	0.092**	0.053	0.065*
	[0.040]	[0.039]	[0.038]
Post	-0.074	0.008	0.044
	[0.090]	[0.073]	[0.069]
Post× EBA Share × *Large*	-0.201**		
	[0.079]		
Post× *Large*	0.118**		
	[0.057]		
Post× EBA Share × *High Short-Term*		-0.126**	
		[0.055]	
Post× *High Short-Term*		0.076*	
		[0.040]	
Post× EBA Share × *High Acc. Payable*			0.098*
			[0.051]
Post× *High Acc. Payable*			-0.034
			[0.037]
Size $_{t-1}$		-0.004	-0.008
		[0.024]	[0.023]
Internal Market $_{t-1}$	0.041	0.009	0.054
	[0.045]	[0.050]	[0.049]
Any PDO $_{t-1}$	0.103***	0.110***	0.107***
	[0.036]	[0.036]	[0.036]
Firm FE	Yes	Yes	Yes
Year X Region	Yes	Yes	Yes
No. Observations	1855	1716	1808
No. Firms	381	352	371
Adjusted R^2	0.798	0.797	0.799

Table 5: Effect of Credit Constraints on Quantity

This table presents the impact of the EBA Capital Exercise on quantity produced. From column 1 to 3, the outcome variable is the logarithm of total quantity produced. In columns 4 to 6, it is the percentage of grapes harvested kept for internal production. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size_{t-1} is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Log(Quantity)			**% Harvest for Own Production**		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share × Bank Dep.	-0.199	-0.014	0.041	-0.051	-0.014	-0.004
	[0.243]	[0.141]	[0.134]	[0.069]	[0.048]	[0.048]
Post × EBA Share	0.020	-0.053	-0.075	-0.033	-0.052*	-0.055*
	[0.156]	[0.084]	[0.082]	[0.043]	[0.029]	[0.028]
EBA Share × Bank Dep.	0.124			0.081		
	[0.469]			[0.077]		
Post × Bank Dep.	0.025	0.020	0.011	0.042	0.036	0.018
	[0.156]	[0.085]	[0.087]	[0.042]	[0.035]	[0.033]
Post	0.036	-0.394*	0.279***	0.005	0.733***	0.045
	[0.095]	[0.234]	[0.089]	[0.030]	[0.139]	[0.031]
EBA Share	0.391			0.057		
	[0.363]			[0.052]		
Bank Dep.	-1.041***			-0.050		
	[0.307]			[0.054]		
Size $_{t-1}$			0.183***			0.025
			[0.052]			[0.022]
Internal Market $_{t-1}$			-0.120			-0.035
			[0.113]			[0.036]
Any PDO $_{t-1}$			-0.003			-0.006
			[0.050]			[0.024]
Firm FE	No	Yes	Yes	No	Yes	Yes
Year X Region	No	Yes	Yes	No	Yes	Yes
No. Observations	2471	2320	1855	1653	1513	1322
No. Firms		413	381		299	265
Adjusted R^2	0.04	0.915	0.929	0.012	0.713	0.645

Table 6: Effect of Credit Constraints on Product Mix Decisions by Regions with Minimum Ageing Restriction

This table presents the impact of the EBA Capital Exercise on product mix decision of companies inside or outside regions with minimum ageing restriction. The outcome variable is the percentage of PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size$_{t-1}$ is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Regions with Minimum Ageing Restriction					
	Yes			**No**		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share × Bank Dep.	-0.247**	-0.217***	-0.237***	-0.091	-0.098	-0.112*
	[0.102]	[0.079]	[0.080]	[0.085]	[0.066]	[0.067]
Post × EBA Share	0.034	0.036	0.047	0.059	0.059*	0.059
	[0.063]	[0.046]	[0.055]	[0.044]	[0.034]	[0.036]
EBA Share × Bank Dep.	-0.090			0.001		
	[0.142]			[0.135]		
Post × Bank Dep.	0.100	0.122**	0.136**	-0.008	0.025	0.029
	[0.068]	[0.060]	[0.063]	[0.055]	[0.046]	[0.046]
Post	0.020	-0.022	-0.068	0.001	-0.011	0.040
	[0.044]	[0.034]	[0.053]	[0.031]	[0.021]	[0.070]
EBA Share	0.171*			-0.061		
	[0.094]			[0.089]		
Bank Dep.	0.166*			-0.020		
	[0.084]			[0.077]		
Size $_{t-1}$		-0.045	-0.026		-0.013	0.001
		[0.041]	[0.041]		[0.027]	[0.028]
Internal Market $_{t-1}$		0.166**	0.134*		-0.042	-0.016
		[0.070]	[0.073]		[0.057]	[0.060]
Any PDO $_{t-1}$		0.054	0.054		0.146***	0.149***
		[0.041]	[0.048]		[0.045]	[0.049]
Firm FE	No	Yes	Yes	No	Yes	Yes
Year X Region	No	No	Yes	No	No	Yes
No. Observations	1001	752	712	1404	1181	1143
No. Firms		168	168		215	213
Adjusted R^2	0.036	0.796	0.801	0.001	0.782	0.782

Table 7: Effect of Credit Constraints on Product Mix Decisions by Wine Color

This table presents the impact of the EBA Capital Exercise on product mix decision by wine color. The analysis is conditioned on companies operating in regions where a minimum ageing restriction is in place. The outcome variable is the percentage of red (first three columns) or white (last three columns) PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size_{t-1} is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Color					
	Red			**White**		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share × Bank Dep.	-0.175*	-0.149*	-0.219***	-0.072	-0.068	-0.018
	[0.098]	[0.089]	[0.071]	[0.046]	[0.049]	[0.029]
Post × EBA Share	0.001	0.027	0.041	0.033	0.009	0.006
	[0.055]	[0.039]	[0.044]	[0.028]	[0.017]	[0.018]
EBA Share × Bank Dep.	-0.104			0.014		
	[0.118]			[0.069]		
Post × Bank Dep.	0.084	0.090*	0.111**	0.016	0.032	0.025
	[0.061]	[0.053]	[0.054]	[0.025]	[0.024]	[0.022]
Post	0.016	-0.016	-0.060	0.004	-0.006	-0.008
	[0.038]	[0.026]	[0.044]	[0.016]	[0.012]	[0.016]
EBA Share	0.177**			-0.006		
	[0.075]			[0.036]		
Bank Dep.	0.159**			0.006		
	[0.072]			[0.043]		
Size $_{t-1}$		-0.047	-0.017		0.002	-0.009
		[0.037]	[0.037]		[0.015]	[0.017]
Internal Market $_{t-1}$		0.165**	0.103		0.001	0.031
		[0.076]	[0.065]		[0.048]	[0.029]
Any PDO $_{t-1}$		0.044	0.050		0.010	0.004
		[0.037]	[0.043]		[0.010]	[0.009]
Firm FE	No	Yes	Yes	No	Yes	Yes
Year X Region	No	No	Yes	No	No	Yes
No. Observations	1001	752	712	1001	752	712
No. Firms		168	168		168	168
Adjusted R^2	0.045	0.759	0.788	-0.004	0.732	0.832

Table 8: Complementarity between Production Decisions and Characteristics of Current Inventory

This table presents the impact of the EBA Capital Exercise on product mix decision by levels of inventory. A company is defined as having a high level of inventory if it is above the median in the corresponding distribution. The median was computed on the entire sample, i.e. before dropping observations. The outcome variable is the percentage of PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size_{t-1} is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Inventories/Total Assets		**Stock/Total Assets**	
	Low	High	Low	High
	(1)	(2)	(3)	(4)
Post × EBA Share × Bank Dep.	-0.350***	-0.097	-0.218***	-0.052
	[0.118]	[0.065]	[0.078]	[0.073]
Post × EBA Share	0.096*	0.026	0.003	0.054
	[0.051]	[0.042]	[0.057]	[0.041]
Post × Bank Dep.	0.135***	0.035	0.135**	0.029
	[0.051]	[0.048]	[0.061]	[0.052]
Post	-0.036	0.086	0.041	0.109
	[0.406]	[0.057]	[0.124]	[0.073]
Size $_{t-1}$	-0.040	-0.019	-0.017	-0.017
	[0.048]	[0.034]	[0.038]	[0.029]
Internal Market $_{t-1}$	-0.029	0.088	-0.045	0.083*
	[0.083]	[0.062]	[0.080]	[0.049]
Any PDO $_{t-1}$	0.045	0.092**	0.135*	0.101**
	[0.060]	[0.041]	[0.072]	[0.048]
Firm FE	Yes	Yes	Yes	Yes
Year X Region	Yes	Yes	Yes	Yes
No. Observations	453	1402	712	961
No. Firms	145	311	214	237
Adjusted R^2	0.72	0.825	0.765	0.863

Table 9: Effect on Performance

This table presents the impact on performance. In panel A, I estimate the direct impact of EBA Capital Exercise on performance. In panel B, I present the impact on performance mediated by the adjustment in the percentage of PDO wine. Analysis in panel B is restricted to treatment companies (companies with at least 50% of credit from EBA banks). From columns 1 to 3, the outcome variable is the operating profit margin scaled by total assets, where operating profit margin is defined as sales minus cost of goods sold. In columns 4 to 6, the outcome variable is return on assets defined as net income over total assets. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Panel A: Direct Impact (Triple Difference)

	Operating Profit Margin			**Return on Assets**		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share × Bank Dep.	-0.077	-0.041	-0.012	-0.083*	-0.051	-0.025
	[0.050]	[0.039]	[0.032]	[0.050]	[0.042]	[0.038]
Post × EBA Share	-0.002	-0.002	-0.008	-0.002	-0.001	-0.006
	[0.009]	[0.010]	[0.010]	[0.008]	[0.009]	[0.009]
EBA Share × Bank Dep.	-0.019			-0.009		
	[0.020]			[0.020]		
Post × Bank Dep.	0.032**	0.022	0.018	0.035**	0.024*	0.021
	[0.014]	[0.015]	[0.015]	[0.014]	[0.015]	[0.016]
Post	-0.004	-0.006	-0.011	-0.008	-0.010	-0.012
	[0.006]	[0.007]	[0.020]	[0.005]	[0.006]	[0.020]
EBA Share	-0.004			-0.004		
	[0.007]			[0.006]		
Bank Dep.	-0.026**			-0.035***		
	[0.011]			[0.011]		
Size $_{t-1}$		0.005	-0.004		0.013	0.007
		[0.019]	[0.021]		[0.021]	[0.026]
Internal Market $_{t-1}$		-0.014	-0.014		-0.012	-0.009
		[0.011]	[0.011]		[0.010]	[0.010]
Any PDO $_{t-1}$		0.018**	0.014*		0.018**	0.012*
		[0.008]	[0.008]		[0.008]	[0.007]
Firm FE	No	Yes	Yes	No	Yes	Yes
Year X Region	No	No	Yes	No	No	Yes
No. Observations	3022	2096	1865	3022	2096	1865
No. Firms		405	382		405	382
Adjusted R^2	0.027	0.321	0.464	0.031	0.284	0.392

Panel B: Mediated Impact (conditioned on treatment companies)

	Operating Profit Margin			Return on Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × PDO (%)	-0.056**	-0.042**	-0.053*	-0.053*	-0.048*	-0.057*
	[0.027]	[0.021]	[0.029]	[0.027]	[0.026]	[0.030]
Post	0.018**	0.017***	-0.023	0.012	0.014**	-0.022
	[0.008]	[0.006]	[0.020]	[0.007]	[0.006]	[0.021]
PDO (%)	0.000	-0.030	-0.030	0.000	-0.034	-0.037
	[0.009]	[0.031]	[0.032]	[0.008]	[0.031]	[0.032]
Size $_{t-1}$		0.019	0.032		0.030	0.044
		[0.036]	[0.045]		[0.043]	[0.056]
Internal Market $_{t-1}$		-0.003	-0.007		0.008	0.008
		[0.015]	[0.017]		[0.014]	[0.017]
Any PDO $_{t-1}$		0.009	-0.003		0.015	-0.004
		[0.014]	[0.009]		[0.017]	[0.008]
Firm FE	No	Yes	Yes	No	Yes	Yes
Year X Region	No	No	Yes	No	No	Yes
No. Observations	1285	1036	946	1285	1036	946
No. Firms		203	194		203	194
Adjusted R^2	0.01	0.542	0.523	0.012	0.411	0.39

Table 10: Effect of Credit Constraints on Product Mix Decisions by Days Sales of Inventory Ratio

This table presents the impact of the EBA Capital Exercise on product mix decision by companies with high and low days sales of inventory. A company is defined as having high days sales of inventory if days sales of inventory ratio is above the median. The outcome variable is the percentage of PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size_{t-1} is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Days Sales of Inventory			
	High		**Low**	
	(1)	(2)	(3)	(4)
Post × EBA Share × Bank Dep.	-0.168*	-0.175**	-0.150	-0.080
	[0.096]	[0.072]	[0.114]	[0.083]
Post × EBA Share	0.063	0.085*	0.039	0.48
	[0.063]	[0.050]	[9.064]	[0.034]
EBA Share × Bank Dep.	-0.010		-0.085	
	[0.121]		[0.156]	
Post × Bank Dep.	0.001	0.101*	0.057	0.021
	[0.067]	[0.057]	[0.070]	[0.053]
Post	0.038	0.078	-0.023	-0.195
	[0.044]	[0.077]	[0.045]	[0.127]
EBA Share	0.017		0.030	
	[0.084]		[0.102]	
Bank Dep.	-0.000		0.134	
	[0.074]		[0.091]	
Size $_{t-1}$		0.002		0.066**
		[0.035]		[0.030]
Internal Market $_{t-1}$		0.040		0.077
		[0.082]		[0.061]
Any PDO $_{t-1}$		0.133**		0.067
		[0.060]		[0.047]
Firm FE	No	Yes	No	Yes
Year X Region	No	Yes	No	Yes
No. Observations	1248	974	1181	854
No. Firms		242		233
Adjusted R^2	0.001	0.762	0.010	0.859

Table 11: Can certification costs explain the adjustment in product mix?

This table presents the impact of the EBA Capital Exercise on different product categories. The outcome variable is the percentage of PDO wine (columns 1 and 2), percentage of PGI wine (columns 3 and 4) and percentage of non-classified wine (columns 5 and 6) in total production in year t. The first two columns correspond to columns 1 and 6 of table 3 and are presented here to facilitate comparison. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size$_{t-1}$ is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	% PDO		**% PGI**		**% Non-Classified**	
	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share × Bank Dep.	-0.136**	-0.151***	0.102*	0.118**	0.033	0.033
	[0.066]	[0.052]	[0.058]	[0.057]	[0.054]	[0.040]
Post × EBA Share	0.035	0.052*	-0.054*	-0.049	0.019	-0.003
	[0.037]	[0.030]	[0.032]	[0.034]	[0.032]	[0.030]
EBA Share × Bank Dep.	-0.028		-0.029		0.057	
	[0.101]		[0.088]		[0.067]	
Post × Bank Dep.	0.028	0.064*	-0.022	-0.026	-0.005	-0.038
	[0.043]	[0.038]	[0.040]	[0.043]	[0.033]	[0.029]
Post	0.012	0.039	0.001	-0.050	-0.013	0.011
	[0.026]	[0.070]	[0.022]	[0.074]	[0.023]	[0.021]
EBA Share	0.020		0.035		-0.055	
	[0.068]		[0.056]		[0.053]	
Bank Dep.	0.057		0.008		-0.065	
	[0.061]		[0.050]		[0.043]	
Size $_{t-1}$		-0.008		-0.003		0.011
		[0.023]		[0.024]		[0.018]
Internal Market $_{t-1}$		0.033		-0.034		0.000
		[0.046]		[0.044]		[0.032]
Any PDO $_{t-1}$		0.106***		-0.105***		-0.000
		[0.036]		[0.035]		[0.033]
Firm FE	No	Yes	No	Yes	No	Yes
Year X Region	No	Yes	No	Yes	No	Yes
No. Observations	2471	1855	2471	1855	2471	1855
No. Firms		381		381		381
Adjusted R^2	0.002	0.797	-0.001	0.767	0.004	0.747

Table 12: Robustness test: Tobit and Probit

This table presents the impact of the EBA Capital Exercise on product mix decision. Here, I present the estimates based on tobit and probit specifications. In the first three columns (tobit), the outcome variable is the percentage of PDO wine in total production in year t. In the last three columns (probit), the outcome variable is a dummy variable equal to one if a company produces only PDO wine in year t. The later present marginal effect coefficients at the mean. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size_{t-1} is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Tobit			**Probit (100% PDO)**		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share × Bank Dep.	-0.223***	-0.208***	-0.246***	-0.217**	-0.224**	-0.312***
	[0.072]	[0.074]	[0.077]	[0.093]	[0.091]	[0.118]
Post × EBA Share	0.052	0.049	0.079	0.078	0.079	0.145*
	[0.046]	[0.048]	[0.050]	[0.054]	[0.054]	[0.082]
EBA Share × Bank Dep.	-0.004	0.079	0.039	0.139	0.143	0.130
	[0.124]	[0.120]	[0.086]	[0.089]	[0.090]	[0.096]
Post × Bank Dep.	0.057	0.068	0.089*	0.068	0.088	0.139*
	[0.045]	[0.046]	[0.048]	[0.058]	[0.056]	[0.074]
Post	-0.016	-0.021	0.117	-0.068*	-0.070*	0.081
	[0.030]	[0.031]	[0.189]	[0.036]	[0.039]	[0.228]
EBA Share	-0.001	-0.004	0.001	-0.062	-0.025	-0.031
	[0.083]	[0.080]	[0.057]	[0.062]	[0.061]	[0.072]
Bank Dep.	0.027	-0.017	-0.021	-0.018	-0.045	-0.062
	[0.078]	[0.076]	[0.055]	[0.055]	[0.058]	[0.064]
Size $_{t-1}$		-0.038**	0.000		-0.046***	-0.028**
		[0.016]	[0.012]		[0.013]	[0.014]
Internal Market $_{t-1}$		-0.001	-0.041		-0.018	-0.065
		[0.063]	[0.060]		[0.057]	[0.072]
Any PDO $_{t-1}$		0.304***	0.324***		0.140***	0.115**
		[0.032]	[0.033]		[0.031]	[0.045]
Firm FE	No	No	No	No	No	No
Year X Region	No	No	Yes	No	No	Yes
No. Observations	2471	1991	1855	2471	1991	1670
No. Firms	422	392	381			

Table 13: Robustness: Alternative Definitions of Treatment

This table presents the impact of the EBA Capital Exercise on product mix decision using alternative definitions of treatment. In panel A, I define as treatment group all companies with at least one bank relation with affected banks. In panel B, treatment is a dummy variable equal to one whenever a company has a share of credit from affected banks higher than 50%. Panel C uses a continuous measure of exposure to treatment using each bank's distance to EBA target capital ratio. Specifically, I take the logarithm of the weighted average share of credit from affected banks whose weights correspond to each creditor's distance the EBA threshold. The outcome variable is the percentage of PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). All regression include the following controls: Size_{t-1}, Internal Market $_{t-1}$ and Any PDO $_{t-1}$. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Panel A: At least 1 bank relationship with EBA banks [binary]

	All Sample	Min. Ageing Restriction	No Min. Ageing Restriction
	(1)	(2)	(3)
Post × Treat. × Bank Dep.	-0.101*	-0.229**	-0.048
	[0.059]	[0.095]	[0.070]
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year X Region	Yes	Yes	Yes
No. Observations	1855	712	1143
No. Firms	381	168	213
Adjusted R^2	0.796	0.8	0.782

Panel B: At least 50% share of credit from affected banks [binary]

	All Sample	Min. Ageing Restriction	No Min. Ageing Restriction
	(1)	(2)	(3)
Post × Treat. × Bank Dep.	-0.126***	-0.204***	-0.093
	[0.045]	[0.068]	[0.056]
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year X Region	Yes	Yes	Yes
No. Observations	1855	712	1143
No. Firms	381	168	213
Adjusted R^2	0.797	0.801	0.782

Panel C: Log(Average share of credit from affected banks weighted by bank's distance to EBA threshold) [continuous]

	All Sample	Min. Ageing Restriction	No Min. Ageing Restriction
	(1)	(2)	(3)
Post × Treat. × Bank Dep.	-0.036*	-0.048*	-0.033
	[0.019]	[0.025]	[0.024]
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year X Region	Yes	Yes	Yes
No. Observations	1398	540	858
No. Firms	381	129	158
Adjusted R^2	0.811	0.839	0.788

Table 14: Robustness: Different time period or sample

This table presents robustness tests using different time periods or samples. In panel A, I include 2014. In panel B, I exclude 2011 from the analysis (EBA Capital Exercise announcement). In panel C, I present the results when including companies that have produced always 100% PDO wine throughout the period. The outcome variable is the percentage of PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). All regression include the following controls: Size_{t-1}, Internal Market $_{t-1}$ and Any PDO $_{t-1}$. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Panel A: Including 2014

	All Sample	Min. Ageing Restriction	No Min. Ageing Restriction
	(1)	(2)	(3)
Post × EBA Share × Bank Dep.	-0.156***	-0.262***	-0.102
	[0.049]	[0.074]	[0.064]
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year X Region	Yes	Yes	Yes
No. Observations	2182	861	1321
No. Firms	410	192	218
Adjusted R^2	0.795	0.815	0.773

Panel B: Excluding 2011

	All Sample	Min. Ageing Restriction	No Min. Ageing Restriction
	(1)	(2)	(3)
Post × EBA Share × Bank Dep.	-0.169***	-0.293***	-0.110
	[0.061]	[0.093]	[0.079]
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year X Region	Yes	Yes	Yes
No. Observations	1571	610	961
No. Firms	379	167	212
Adjusted R^2	0.799	0.806	0.784

Panel C: Including companies that produce 100% PDO throughout the period (initially removed)

	All Sample	Min. Ageing Restriction	No Min. Ageing Restriction
	(1)	(2)	(3)
Post × EBA Share × Bank Dep.	-0.136***	-0.216***	-0.103
	[0.050]	[0.079]	[0.064]
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year X Region	Yes	Yes	Yes
No. Observations	1942	737	1205
No. Firms	403	178	225
Adjusted R^2	0.806	0.81	0.791

A Appendix

Figure A1: Wine regions in Portugal

Geographical distribution of wine regions in Portugal. *Source*: Wines of Portugal: http://www.winesofportugal.info/pagina.php?codNode=18012&market=1

Figure A2: Example of seal of guarantee - PDO and IGP Alentejo

This figure illustrates the seal of guarantee issued by Alentejo regional industry regulator (CVRA). On the left (right), it is presented the PDO (PGI) seal of guarantee. *Source:* Wines of Alentejo: https://www.vinhosdoalentejo.pt/en/cvr-alentejana/certification-process/

Selos de Garantia

Denominação de Origem Controlada Alentejo.

Vinho Regional Alentejano.

Figure A3: Representation of wine-making process

This diagram depicts the main decision nodes in the wine-making process. Solid arrows indicate the main production flows. Dashed arrows indicate other, less relevant, in or outflows. This figure was constructed by the author based on conversations held with winemakers.

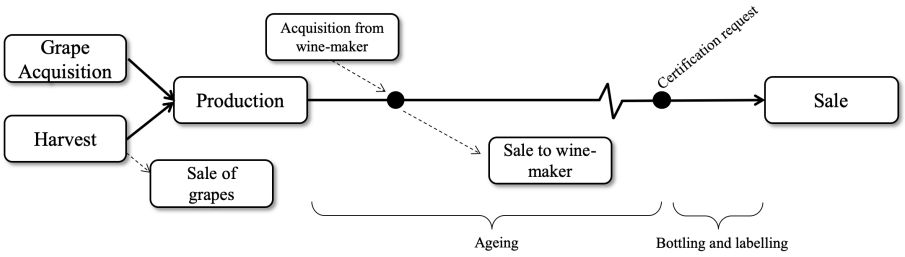


Figure A4: Evolution of PDO wine production in percentage of total

This figure displays the evolution of median (left) and mean (right) PDO wine production in percentage of total annual production. In the top figures, treatment is defined as companies with a share of credit from affected banks above 50%. In the bottom figures, treatment is defined as the intersection between companies with a high share of credit from affected banks (above 50%) and bank dependent companies. Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Vertical lines delimit the period between the EBA Capital Exercise announcement and deadline.

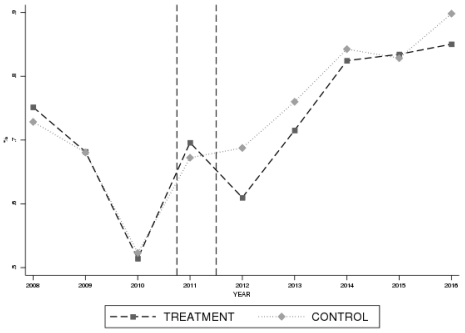
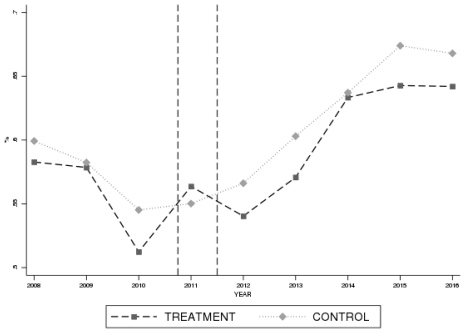
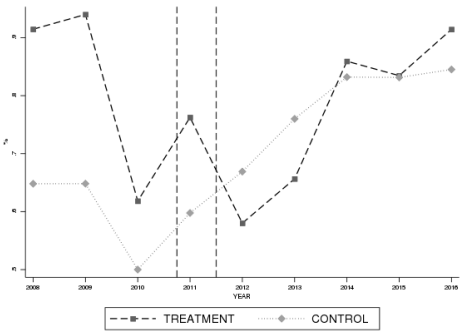
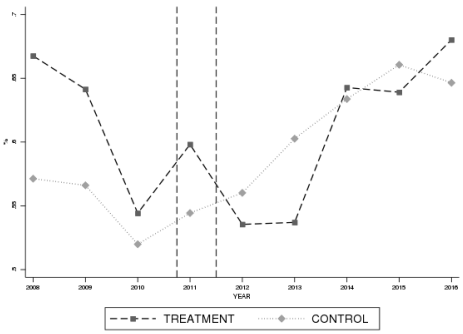
Treatment	Median	Mean
High EBA Share		
High EBA Share + Bank Dependent		

Figure A5: Histogram of PDO production

This figure depicts an histogram of the PDO wine production (in percentage of total production). It is computed based on each company's mean over time.

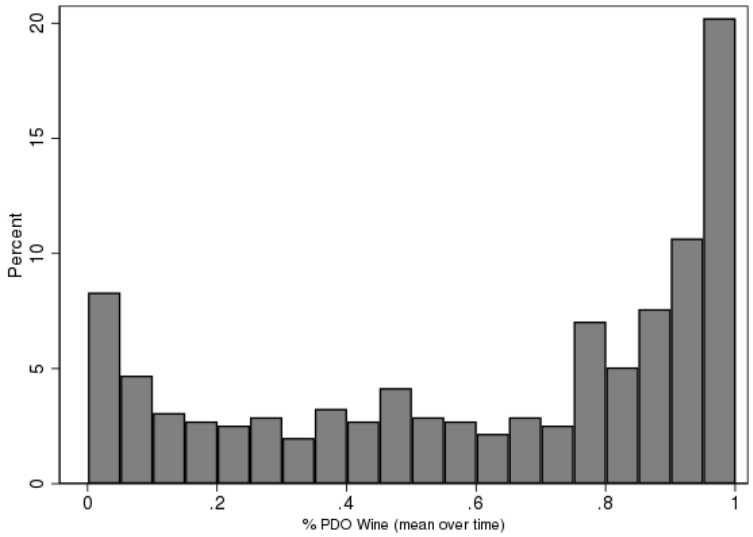


Table A1: Description of Production Stages

This table describes each of the main stages in the wine production process (see figure A3).

Stage	Description
Harvest	Harvesting is the first step in the wine making process. Grapes should be harvested at the precise time, preferably when physiologically ripe for the intended type of wine. In Portugal, it occurs between August and October. Wineries can produce grapes in their own estates or acquire grapes from external winegrowers or cooperative. Traditionally, vineyard management and wine-making were separated activities. Nowadays, winemakers own large vineyard plots. Yet, acquiring grapes from winegrowers is still very common as it allows wineries, in particular large ones, to acquire raw-materials necessary to satisfy large production levels. This is the case in Portugal, particularly due to tight permits for new vineyard planting and limits on maximum yield. The appellation systems (*appellation contrôlée*) in place in many European Countries intend to control production and ensure quality standards in each wine region. These regulations often start with vineyard planting and classification. Typically, planting new vineyards can only be carried out following regulators' permits and is subject to narrow annual quotas. Moreover, each vineyard can be classified as PDO or PGI. This classification depends on vineyard characteristics, number of vines and grape varieties. This classification is usually fixed throughout the vineyard useful life. In order to produce wine with any of these certifications, grapes must come from vineyards classified in the same way. This is a necessary but far from sufficient step (more details about certification are given below). Regional authorities keep track of grape classification and respective quantities declared by any agent that produces grapes for commercial purposes ('*current accounts*'), as well as sales between agents ('*movements*'). Every time a *movement* occurs, the *current accounts* of both seller and buyer are updated. At this stage, companies buy and sell grapes with different classifications to attain the desired product mix in each year.
Production	Production occurs right after the harvest and includes crushing and pressing, fermentation and clarification. By the end of this stage, winemakers are required to declare total production levels by type and color. They also report the certification a given quantity is suitable for (PDO, PGI or non-classified wine). At this point, this is based on the classification of grapes it was made from. The *current accounts* are updated with this new information and it limits the quantity a company can request for certification.
Ageing and Bottling	The last stage of the wine production process involves ageing and bottling. Depending on the type and color of wine, the winemaker can bottle wine immediately after clarification or can be given additional maturation (usually in oak barrels or stainless steel tanks). Ageing is considered to follow two phases. The first – maturation – refers to the period between fermentation and bottling. It frequently lasts from 6 to 24 months. The second phase – reductive ageing - starts with bottling and occurs in the absence of oxygen. In Portugal, wineries are required to declare inventory levels and respective characteristics (year of harvest, type, color, quantity) every year to regional regulators.
Certification	Companies can request certification and the respective numbered seals of guarantee as soon as the wine has been produced. The timing may depend on technical factors, such as the optimal ageing point or the existence of minimum ageing regulations, or economic variables, such as market dynamics (e.g. demand). The first step of a certification procedure is the validation of the request against company's *current accounts*. Then, a sample of wine is subject to physicochemical analysis at the regulators' laboratories. Simultaneously, a sensory analysis is performed by a tasting panel. After that, if all requirements are met, the wine is certified as PDO or PGI and the respective seals of guarantee are issued. The newly certified wine is ready to be introduced in the market. In opposition, producers may request declassification of wine previously registered in their current accounts as suitable for PDO or PGI wine. The request must be submitted to regional regulators who may approve or refuse it (IVV, 2018). Further details on the institutional organization of the wine sector can be found on Decree-law 212/2004, Ministry of Agriculture, Portugal https://dre.pt/web/guest/pesquisa/-/search/479875/details/maximized.

Table A2: Description of products per wine regions in Portugal

This table describes products in each wine region in Portugal with regard to certification and type. It also presents the trading name of each product. From column 4 to 8, it reports the mandatory minimum ageing period (in months) for each type of wine (and color in the case of still wines). 'x' indicates that PDO or PGI certification exists for each type of wine (still, liqueur or sparkling) in each region. I replace 'x' by the corresponding minimum ageing period (in months) for wines with mandatory minimum ageing. For the sake of simplicity I omit semi-sparkling type and rose color. Last column indicates the regions where there are minimum ageing restrictions on PDO production cycle. Minimum ageing periods for PDO Porto (Port wine) can vary from several months to decades, depending on the sub-type and quality. Due to the complexity of this product regulation, I prefer not to report any minimum ageing period [a]. *Source:* IVV technical specifications (http://www.ivv.gov.pt/np4/528/) and IVV yearbook 2016 (http://www.ivv.gov.pt/np4/Anuário).

Region	**Certif.**	**Trading name**	**Min. Ageing**				**Min. Ageing Restriction**
			Still		**Liq.**	**Spark.**	
			Red	**White**			
Vinho Verde	PGI	Minho	x	x	x	x	No
	PDO	Vinho Verde	x	x		9*	
Trás-os-Montes	PGI	Trasmontano	x	x			No
	PDO	Trás-os-Montes	x	x	x	x	
Douro	PGI	Duriense	6	x		9	Yes
	PDO	Douro	8	1	18	9	
	PDO	Porto			**[a]**		
Távora-Varosa	PGI	Terras de Cister	x	x		x	No
	PDO	Távora-Varosa	x	x		9	
Bairrada	PGI	Beira Atlântico	x	x		x	No
	PDO	Bairrada	x	x	x	9	
Beira Interior	PGI	Terras da Beira	x	x		x	No
	PDO	Beira Interior	x	x		x	
Dão	PGI	Terras do Dão	x	x		x	Yes
	PDO	Dão	8	x		9	
	PDO	Lafões	6	x			
Lisboa	PGI	Lisboa	x	x	x	x	Yes
	PDO	Encostas D'Aire	8	x			
	PDO	Óbidos	8	x		9	
	PDO	Alenquer	8	x			
	PDO	Arruda	14	3			
	PDO	Torres Vedras	8	3			
	PDO	Bucelas	x	x		x	
	PDO	Carcavelos			30		
	PDO	Colares	24	9			
Tejo	PGI	Tejo	x	x		x	Yes
	PDO	DoTejo	6	x	x	9	
Pen. de Setúbal	PGI	Pen. de Setúbal	x	x	x	x	No
	PDO	Setúbal			18		
	PDO	Palmela	x	x	x	x	
Alentejo	PGI	Alentejano	x	x	x	x	No
	PDO	Alentejo	x	x	x	x	
Algarve	PGI	Algarve	x	x	x	x	Yes
	PDO	Lagos	6	x			
	PDO	Portimão	6	x			
	PDO	Lagoa	6	x			
	PDO	Tavira	6	x			
Madeira	PGI	Terras Madeirenses	x	x			Yes
	PDO	Madeira			2		
	PDO	Madeirense	6	x			
Açores	PGI	Açores	8	6	8	x	Yes
	PDO	Biscoitos	6	6	24	x	
	PDO	Graciosa	6	6	24	x	
	PDO	Pico	6	6	24	x	

Table A3: EBA Capital Exercise Impact on Firms' Total Credit

This table presents the impact of the EBA Capital Exercise on firms' total credit. The outcome variable is non-current liabilities scaled by (lagged) total assets. Columns 1 and 2 present the results for the entire sample. In columns 3 and 4, I condition the analysis on companies that are bank dependent. Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). In columns 5 and 6, I present the results on a triple difference interaction with Post, EBA Share and Bank Dependent. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Size_{t-1} is logarithm of total assets in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	All Sample		**Bank Dependent**		**All Sample**	
	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share	-0.108**	-0.120**	-0.260**	-0.261**	0.003	-0.014
	[0.051]	[0.054]	[0.120]	[0.114]	[0.016]	[0.020]
Post	0.043***	0.075***	0.103***	0.159***	-0.006	0.022
	[0.016]	[0.027]	[0.033]	[0.050]	[0.011]	[0.019]
Post × EBA Share × Bank Dep.					-0.263**	-0.246**
					[0.121]	[0.110]
Post × Bank Dep.					0.109***	0.117***
					[0.034]	[0.038]
Size $_{t-1}$		-0.143*		-0.218**		-0.141*
		[0.075]		[0.107]		[0.073]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
No. Observations	2672	2672	1096	1096	2648	2648
No. Firms	436	436	187	187	428	428
Adjusted R^2	0.356	0.381	0.307	0.352	0.362	0.387

Table A4: Comparison of Means

Panel A of this table presents a comparison of means between the sub-sample of companies with at least 50% of credit from affected banks and the sub-sample of companies with less than 50% of credit from affected banks at the time of the EBA Capital Exercise announcement (October 2011). Companies with no credit outstanding are excluded from the analysis. Panel B presents a mean comparison between companies inside and outside regions where minimum ageing restrictions are in place. All means are reported at the end of 2011. In the last column I present the difference in means. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Panel A: At least 50% Share of Credit From Affected Banks

	At least 50% Share of Credit From Affected Banks				
	Yes		**No**		**Diff.**
	Obs.	**Mean**	**Obs.**	**Mean**	
Total Assets	201	5765681.3	197	3592126.5	-2173554.8***
Nr. Employees	201	26.98	197	14.77	-12.21*
Sales	201	2222195.8	197	1363153.4	-859042.41**
ROA	199	-0.02	195	-0.03	-0.01
Leverage	201	0.73	197	0.67	-0.06
Inv./Assets	201	0.26	197	0.25	-0.01
Days in inv.	199	1534.02	192	1361.45	-172.57
Bank Rel.	201	3.27	197	3.25	-0.02
Largest bank rel.	201	0.76	197	0.76	0.00
Pct. short-term	182	0.48	185	0.43	-0.05
Region Min. Ageing Restriction	193	0.50	196	0.44	-0.06
PDO	162	0.55	154	0.55	0.00
Harvest for own production	121	0.91	109	0.91	0.00
Red wine	162	0.59	154	0.51	-0.08*
Bottled wine	176	0.20	161	0.20	0.00
No. bank relationships:					
All	201	3.28	197	3.28	0.00
With affected banks	201	1.69	197	0.80	-0.89***
With affected banks:					
At least 1 relation	201	1.00	197	0.53	-0.47***
Share of credit	201	0.86	197	0.11	-0.75***

Panel B: Region with Minimum Ageing Restriction

	Region with Minimum Ageing Restriction				
	Yes		**No**		**Diff.**
	Obs.	**Mean**	**Obs.**	**Mean**	
Total Assets	207	4381979.2	259	3489156.2	-892823
Nr. Employees	207	18.42	259	14.16	-4.258
Sales	207	1546460	259	1293609.3	-252850.7
ROA	203	-0.02	254	-0.04	-0.028
Leverage	207	0.75	259	0.70	-0.052
Inv./Assets	207	0.25	259	0.23	-0.012
Days in inv.	202	1779.21	252	1294.15	-485.1*
Bank Rel.	196	3.05	241	2.74	-0.308
Largest bank rel.	185	0.77	211	0.76	-0.010
Pct. short-term	172	0.50	191	0.43	-0.069
Region Min. Ageing Restriction				-	
PDO	126	0.43	240	0.63	0.198***
Harvest for own production	96	0.88	185	0.86	-0.028
Red wine	126	0.72	240	0.47	-0.253***
Bottled wine	166	0.17	206	0.24	0.066**
No. bank relationships:					
All	183	3.32	206	3.19	-0.128
With affected banks	183	1.21	206	1.24	0.025
With affected banks:					
At least 1 relation	183	0.77	206	0.76	-0.008
Share of credit	183	0.51	206	0.45	-0.055

Table A5: Effect of Credit Constraints on Product Mix Decisions (double difference)

This table presents the impact of the EBA Capital Exercise on product mix decision using a double-difference specification. The analysis is conditioned on bank dependent companies. The outcome variable is the percentage of PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size_{t-1} is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share	-0.100*	-0.098**	-0.099**	-0.081	-0.089**	-0.085**
	[0.054]	[0.047]	[0.045]	[0.051]	[0.045]	[0.043]
Post	0.040	0.039	-0.028	0.050	0.041	0.126
	[0.035]	[0.033]	[0.147]	[0.035]	[0.033]	[0.100]
EBA Share	-0.008			0.041		
	[0.074]			[0.063]		
Size $_{t-1}$				-0.014	-0.016	0.004
				[0.017]	[0.037]	[0.037]
Internal Market $_{t-1}$				-0.063	0.003	-0.008
				[0.100]	[0.070]	[0.086]
Any PDO $_{t-1}$				0.526***	0.108*	0.151***
				[0.040]	[0.055]	[0.056]
Firm FE	No	Yes	Yes	No	Yes	Yes
Year X Region	No	No	Yes	No	No	Yes
No. Observations	1001	1001	978	803	803	782
No. Firms		182	181		166	165
Adjusted R^2	0.001	0.686	0.696	0.234	0.713	0.73

Table A6: Effect of Credit Constraints on Product Mix Decisions by Regions with Minimum Ageing Restriction (double difference)

This table presents the impact of the EBA Capital Exercise on product mix decision of companies inside or outside regions with minimum ageing restriction using a double-difference specification. The analysis is conditioned on bank dependent companies. The outcome variable is the percentage of PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size$_{t-1}$ is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Regions with Minimum Ageing Restriction					
	Yes			**No**		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share	-0.213***	-0.187***	-0.165**	-0.032	-0.038	-0.043
	[0.080]	[0.068]	[0.072]	[0.073]	[0.057]	[0.054]
Post	0.121**	0.100*	0.067	-0.007	0.013	0.114
	[0.051]	[0.051]	[0.051]	[0.045]	[0.041]	[0.099]
EBA Share	0.081			-0.059		
	[0.106]			[0.102]		
Size $_{t-1}$		-0.080	-0.034		0.004	0.016
		[0.080]	[0.088]		[0.039]	[0.044]
Internal Market $_{t-1}$		0.039	-0.047		-0.006	0.043
		[0.113]	[0.157]		[0.087]	[0.101]
Any PDO $_{t-1}$		0.047	0.057		0.146**	0.208***
		[0.099]	[0.114]		[0.065]	[0.060]
Firm FE	No	Yes	Yes	No	Yes	Yes
Year X Region	No	No	Yes	No	No	Yes
No. Observations	400	303	289	597	496	493
No. Firms		69	69		96	96
Adjusted R^2	0.004	0.729	0.735	0	0.705	0.731

Table A7: Effect of Credit Constraints on Product Mix Decisions by Wine Color (double difference)

This table presents the impact of the EBA Capital Exercise on product mix decision by wine color using a double-difference specification. The analysis is conditioned on bank dependent companies. The analysis is conditioned on companies operating in regions where a minimum ageing restriction is in place. The outcome variable is the percentage of red (first three columns) or white (last three columns) PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size_{t-1} is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Color					
	Red			**White**		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share	-0.174**	-0.125	-0.158**	-0.039	-0.062	-0.007
	[0.081]	[0.081]	[0.063]	[0.037]	[0.048]	[0.024]
Post	0.100**	0.076	0.053	0.020	0.024	0.014
	[0.048]	[0.046]	[0.047]	[0.020]	[0.022]	[0.011]
EBA Share	0.073			0.008		
	[0.092]			[0.059]		
Size $_{t-1}$		-0.068	-0.007		-0.012	-0.027
		[0.074]	[0.086]		[0.026]	[0.030]
Internal Market $_{t-1}$		0.143	0.004		-0.104	-0.051
		[0.123]	[0.120]		[0.099]	[0.062]
Any PDO $_{t-1}$		0.057	0.075		-0.010	-0.017
		[0.087]	[0.098]		[0.021]	[0.025]
Firm FE	No	Yes	Yes	No	Yes	Yes
Year X Region	No	No	Yes	No	No	Yes
No. Observations	400	303	289	400	303	289
No. Firms		69	69		69	69
Adjusted R^2	0.003	0.698	0.746	-0.006	0.672	0.805

Table A8: Effect of Credit Constraints on Product Mix Decisions in Regions with No Minimum Ageing Restriction

This table presents the impact of the EBA Capital Exercise on product mix decision by wine color. The analysis is conditioned on companies operating in regions where there is no minimum ageing restriction in place. The outcome variable is the percentage of red (first three columns) or white (last three columns) PDO wine in total production in year t. Post is a binary variable equal to one from 2012 onward. EBA Share is the share of credit from affected banks at the time the announcement (October 2011). Bank dependent is a dummy variable equal to 1 when the company has a high debt ratio (non-current liabilities scaled by total assets above the median). Size$_{t-1}$ is logarithm of total assets in the previous year. Internal Market $_{t-1}$ is the percentage of sales in the domestic market. Any PDO $_{t-1}$ is a dummy variable equal to 1 when the company has produced some PDO wine in the previous year. Additional time invariant variables and interactions are captured by fixed effects and are therefore omitted. The sample covers the period 2006-2013. Robust standard errors clustered at firm level are shown in parentheses. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	Color					
	Red			**White**		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × EBA Share × Bank Dep.	-0.107*	-0.065	-0.068	0.016	-0.033	-0.044
	[0.057]	[0.042]	[0.043]	[0.076]	[0.056]	[0.055]
Post × EBA Share	0.018	0.029	0.029	0.041	0.030	0.029
	[0.038]	[0.031]	[0.032]	[0.035]	[0.022]	[0.024]
EBA Share × Bank Dep.	-0.014			0.015		
	[0.084]			[0.139]		
Post × Bank Dep.	0.009	0.015	0.019	-0.017	0.010	0.010
	[0.035]	[0.028]	[0.027]	[0.048]	[0.040]	[0.038]
Post	0.019	0.003	0.045	-0.019	-0.013	-0.005
	[0.023]	[0.019]	[0.064]	[0.026]	[0.014]	[0.020]
EBA Share	0.023			-0.083		
	[0.060]			[0.090]		
Bank Dep.	-0.034			0.013		
	[0.045]			[0.079]		
Size $_{t-1}$		-0.019	-0.013		0.006	0.014
		[0.021]	[0.022]		[0.016]	[0.018]
Internal Market $_{t-1}$		-0.018	-0.011		-0.024	-0.005
		[0.045]	[0.046]		[0.041]	[0.043]
Any PDO $_{t-1}$		0.111***	0.114***		0.035	0.034
		[0.036]	[0.039]		[0.026]	[0.027]
Firm FE	No	Yes	Yes	No	Yes	Yes
Year X Region	No	No	Yes	No	No	Yes
No. Observations	1404	1181	1143	1404	1181	1143
No. Firms		215	213		215	213
Adjusted R^2	0.009	0.736	0.739	0.001	0.89	0.894