Multi-establishment Firm Structure, Subsidies and Spillovers[*]

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Abstract   How do firms diffuse resources, and does this result in spillovers far from headquarters? We show subsidies induce French firms to hire new workers, mainly in new establishments and often in new commuting zones, with little evidence of reallocation. The most hiring responsive occupations are techies and support workers in line with R&D targeting. We estimate a subsidy employment spillover elasticity of .11 at the commuting zone level within industry, but weak effects in the commuting zone. Dispersed industries have half this elasticity and concentrated industries twice this elasticity. While subsidies are awarded to headquarters in advanced areas, firms redistribute effects more broadly.

Key Words: Multi-establishment Firms; Organization of Production; Subsidies; Directed Growth; Spillovers.

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1 Introduction

Well-designed policies can both provide and diffuse resources, potentially generating positive returns and spillovers. Using subsidies, governments often increase firms' incentives to pursue activities such as R&D by direct support or tax incentives. Multi-establishment (ME) firms, nearly half of whom are also multi-location, disproportionately receive R&D subsidies in France. These subsidies need not only be deployed in Headquarters (HQs) as information and know-how spread quickly throughout a firm, and firms may deploy assets tactically to develop and adapt innovations across establishments. In addition, firms may benefit from spillovers close to outside establishments and may generate spillovers themselves. For these reasons, subsidies alter the structure of production *within* firms and impact their establishment composition. Furthermore, subsidies may induce transferable effects or know-how in certain industries or areas.

Policies designed to on-shore economic activity, innovation and employment such as the US CHIPS and European Chips acts show signs of crowding in domestic investment, but how these policies will diffuse resources is unknown. An already existing French R&D subsidy (Crédit d'Impôt Recherche, or CIR) provides similar incentives to a broad base of firms and serves as a laboratory to examine policy effects. Focusing on the role of ME firms whose structure is detailed in Andrieu and Morrow (2023), this paper estimates how the CIR shapes firm growth and the diffusion of policy effects. While a large literature associates firms activities with their HQs, we add to the growing literature using an establishment based view to more granularly follow policy reach outside of HQ dense areas.

To estimate the impact of subsidies on firms, we implement a novel shift-share instrumental variable (IV) strategy (Adão et al. (2019), Borusyak et al. (2021)), relying on recent studies that show how shocks propagate across establishments within firm boundaries. Identification stems from location-specific *shifts* over time in subsidies awards, which firms are exposed to based on their initial employee *shares* in locations.[1] This approach allows for the inclusion of CZ-time fixed effects to control for regional trends to identify the effect of subsidies across the firm. Our estimates show that subsidies helps firms to expand geographically through an increase in establishments and coverage of commuting zones (CZs).

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[1] We implement the most recent shift-share IV design by Adão et al. (2019) and Borusyak et al. (2021), in which the share is the importance of a location for a firm, and the identification comes from the shift in regional amounts of R&D subsidy and how firm are differently exposed.

Figure 1: Bordes Commune in Southwestern France

(a) 2005   (b) 2021

Note: Maps of the commune Bordes, in the Pyrénées-Atlantiques department in southwestern France for 2005 and 2021.
Source: Institut national de l'information géographique et forestière (https://remonterletemps.ign.fr/).

Subsidies increase firm employment:[2] A 100 percent increase[3] in the cumulative subsidy increases employment by 2.2%.[4] To illustrate, Figure 1 shows Bordes, an area in the South West of France, an area with few HQs but that our later estimates predict high levels of hiring due to subsidies. The left panel shows Bordes in 2005 with few industrial developments and small residential areas, while the right panel shows Bordes in 2021 with both visibly increased. In addition, there is heterogeneity in the occupational labour elasticity with respect to the subsidy. Paired with the layered occupational structure documented in Andrieu and Morrow (2023), this has rich implications for the pattern of firm responses across establishments. Examining *which* new occupations firms hire and *where* highlights their role in distributing resources. In fact, new establishments exhibit a stronger hiring response than incumbent establishments, with techies and higher skill workers showing the highest responses, showing skill bias. We find little evidence of within firm worker reallocation from the policy, suggesting these new establishments are tactical and activity specific.

While subsidy benefits are viewed as important within the boundaries of firms, knowledge transfer may generate positive externalities (Bloom et al. (2013)), and spread with firm coverage.[5] To assess this, we use occupation elasticity estimates to construct the predicted number

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[2]See Dortet-Bernadet and Sicsic (2017) for highly qualified workers in SMEs, Bunel et al. (2019) for technicians in SMEs (studying a different French innovation subsidy, CII), Duhautois et al. (2022) who focus is the Community Innovation Survey (CIS), Salies (2021a) for a review of the literature on the impact on R&D workers only.

[3]We estimate the effects of cumulative subsidy due to lagged effects and the persistence of receiving it (in 2011, 87% of ME firms also got it in 2012) and in amount, i.e. 54% of firms getting the subsidy in 2011 and 2012 got a higher amount in 2012.

[4]Estimates do not appreciably vary by firm size, so that the employment effects found here would not be lost by redirecting subsidies towards smaller firms as suggested by Aghion et al. (2022).

[5]In fact, work shows that innovation spreads rapidly within the boundaries of the firm (e.g. Markusen (1984),

of additional employees in new establishment-CZs as an instrument. We use this to predict actual additional employees in a first stage, then a second stage estimates employment spillovers in non-beneficiary establishments.[6] CZ-industry cells have an employment spillover elasticity of 11.1 per cent controlling for industry and CZ-year fixed effects, whereas this effect is not significant in the CZ as a whole. These findings support technologically linked spillovers over local multiplier effects. Further splitting these effects by industry concentration as in Mian and Sufi (2014), we find concentrated industries have a spillover elasticity of .25, which more evenly distributed industries have an elasticity of .06. This suggests that the largest diffusion spillovers are found in existing agglomerations.

This section continues with a literature review, while Section 2 describes the data and variables and Section 3 lays out the stylized facts on ME firm structure. Section 4 discusses the CIR, a French R&D subsidy policy, our IV strategy and direct policy impacts at the firm level. Section 5 estimates local policy spillover effects. Section 6 concludes.

Related Literature

Firms contribute substantially to the development of economies through trade and foreign direct investment, but less is known about their role in diffusing resources across their domestic market. The increasing availability of establishment level data has revealed spatial and organisational aspects of firms, differentiating firms from establishments. Jiang (2021) explains spatial expansion with the decreasing costs of ICT and investment, while Cao et al. (2019) document US firms' growth through the establishment margin, particularly for large firms. Kleinman (2022) studies the increasing trend of multi-region firms and how this contributes to spatial wage inequalities, as headquarters get more skilled as firm size increases. Gumpert et al. (2021) study managerial organization, exploiting the fact that local economic conditions propagate to other establishments of the firm. This mechanism has also been studied by Giroud and Mueller (2019) and Giroud et al. (2021) who find that shocks propagate to distant regions within the firm boundary. We contribute to this literature by using ME firm structure to understand how they diffuse resources and drive local development.

We also contribute to what is known about the structure of activity within firms. Studies show that geographic frictions between the headquarters and establishments have a negative impact on firm performance (Giroud (2013)) as well as in multinational firms (Kalnins and

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Giroud (2013)) implying firms may be effective diffusers of innovation and resources.

[6]The R&D 'reflection problem' is illustrated by Eberhardt et al. (2013) who show that firms benefit from both their own-R&D and spillover effects. Using new beneficiary establishments as a treatment helps isolate the subsidy spillover channel.

Lafontaine (2013)). Some known mechanisms are at play, such as managerial frictions (Gumpert et al., 2021), knowledge transfer costs (Keller and Yeaple, 2013) and transportation costs or informational frictions (Allen, 2012).

This paper also examines spillovers far from headquarters through establishments that promote knowledge diffusion and absorption within firms. Giroud et al. (2021) confirms the distances between firms matter for spillovers but not within firms.[7] From the multi-establishment perspective, proximity can be both geographic through co-located branches in addition to technological as in Jaffe (1986) or Bloom et al. (2013), or through text analysis as in Myers and Lanahan (2022). Other examples include export spillovers (Koenig et al. (2010), Tian and Yu (2022)), where the knowledge of nearby exporters reduces costs, or shocks, where impacted employment can affect economically close but non-impacted industries (Helm (2020)), or through subsidies upstream as in Navarra (2023). Moretti (2010) highlights the effect of job creation from new manufacturing jobs to non-tradable jobs. As we find skill biases in hiring, this aligns with the importance Akcigit et al. (2020) place on combined R&D subsidies and higher education policy for economic growth.

Finally, we contribute to a growing literature using the shift-share IV design of Borusyak et al. (2021). To evaluate the causal effect of the subsidy, we use a differential exposure design similar to shift-share IVs.[8] To construct the share component, we use establishment level occupational share data and CZ shifts, a novel instrument for firms but one widely applicable.

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[7]Knowledge sharing has been studied across and within firms and Giroud et al. (2021) show that spillovers between plants but of different firms decrease rapidly with geographical distance, but no distance effect within the boundaries of the firm.

[8]This design has been used to study local labour market responses to the China import shock (Autor et al. (2013), revisited in Borusyak et al. (2021)), mergers (Cowgill et al. (2021)), the fall in the cost of investments on firm level outcomes (Aghion (2022)).